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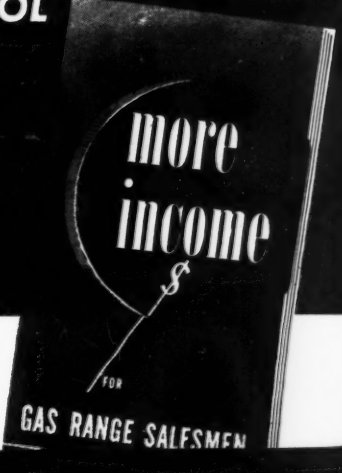

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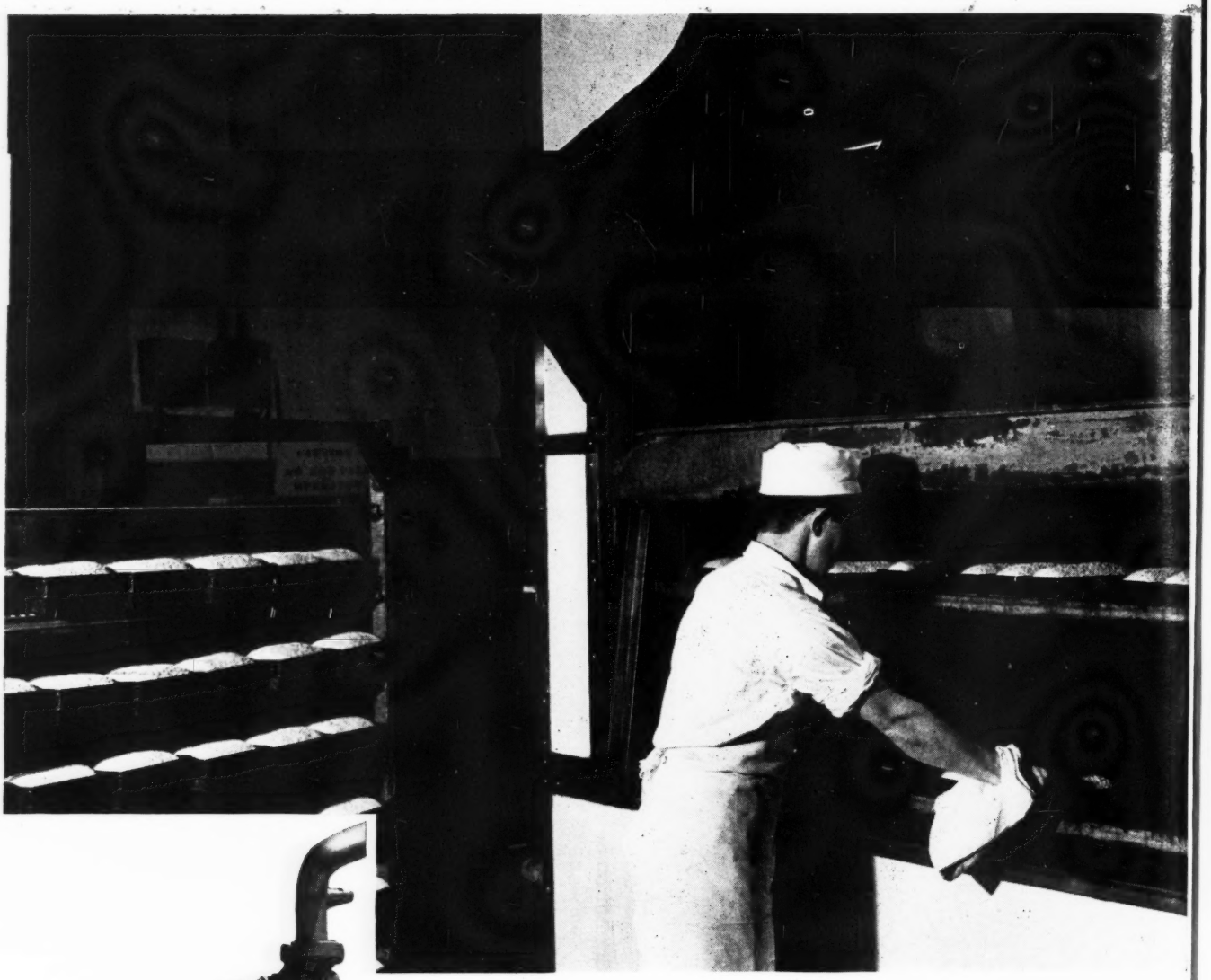

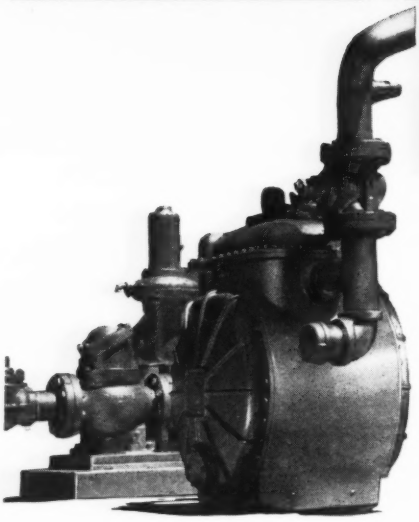

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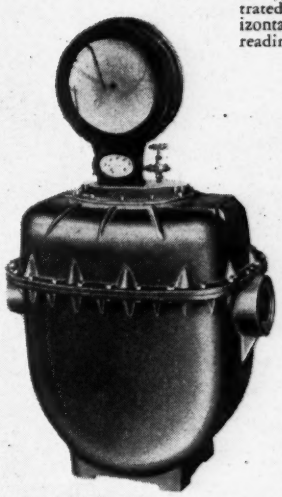

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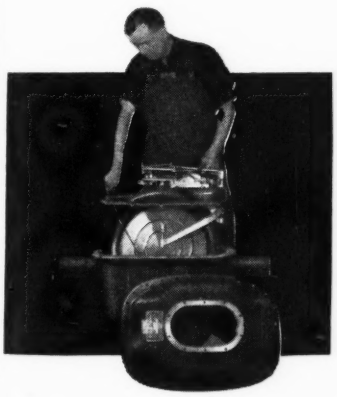

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GAS

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Publication Office

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Branch Offices

DAVID CARMEN, Manager, **CHICAGO 3,** 1064 Peoples Gas Building, WABash 2589
GERARD A. REGAN, Mgr., **NEW YORK 17,** 52 Vanderbilt Ave. MUrray Hill 4-1880
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TECHNICAL TRENDS

by Guy Corfield

Gas Leakage Tracer

ON many occasions when gas leakage investigations are being made, there arises the problem of trying to discover which of several gas lines at or near the location is the source of the leak. Sometimes, also, structures or sources other than the gas mains may be suspected, but samples that are obtainable are too similar or too dilute for positive identification by conventional analytical means. It would be very helpful to be able to inject some tracer substance into the gas mains which, by appearance or non-appearance in the leakage gas, and by concentration if appearing, would give positive information. Such a substance would preferably be a gas capable of compression into cylinders; to be most satisfactory it should be cheap, non-toxic, non-corrosive, and not absorbed or decomposed by pipe materials or soil or moisture, etc.; it should not be a normal constituent of fuel gases or otherwise naturally occurring at the site of a leakage investigation; and it should be quantitatively detectable by portable analytical instruments, with considerable precision but relatively easy and rapid technique.

The above is a formidable and exacting list of requirements. It appears, however, distinctly possible that they can be met by the use of *helium* in conjunction with analytical apparatus now in the process of development.

A little less than a year ago two United States Bureau of Mines Reports of Investigations, No. 3897 and 3899, described work done in the Elk Hills oil field of California using helium as a tracer to follow the migration of injected natural gas in an underground reservoir. Helium was added to the gas entering the injection well and its appearance in gas withdrawn from adjacent wells indicated the underground travel. Analysis of helium content was made by portable apparatus developed at the Bureau of Mines. (See GAS, Oct. 1946, page 35, for reprint of Report of Investigations 3897 describing the field work and results. Report of Investigations 3899 deals with the analytical apparatus.)

More recently the Consolidated Engineering Corp., 620 North Lake Ave., Pasadena 4, Calif., has announced development of helium detection apparatus employing the mass spectrometer principle. This apparatus was designed for the general purpose of detecting leakage in vacuum or pressure systems, using a helium-air mixture as either an envelope around the vacuum vessel or as the pressurizing medium of a pressure container. The instrument is of portable size and weight, but requires access to 115 volt, 60 cycle electrical supply with consumption of 850 watts; it also requires dry ice or liquid nitrogen, but not water. Sensitivity is adjustable to compensate for trace quantities of helium in the atmosphere. A signal system incorporated in the instrument produces an audible note with pitch roughly proportional to the helium content of the sample it receives.

It is not difficult to visualize the possible adaptation of these procedures to the identification of an underground leakage source as discussed above. Helium could be injected into the gas main from pressure containers, and the leakage points examined for its appearance. The proximity and intensity of a leak source could in many instances be estimated from the relationships of rate of gas flow and helium injection in the main, and time of appearance and concentration of helium at the leak sample point.

Whether this procedure can be developed for practical application in general leakage work, or whether it can only be used in difficult situations where a rapid and definite solution to the problem is imperative, would seem to depend largely on the cost and accuracy and sensitivity of the helium detection apparatus. Unless the instrument was extremely sensitive it would be necessary to inject relatively large quantities of helium if a high capacity gas main were under test for a lengthy period. However, it seems probable that there would be many circumstances involving relatively small quantities of gas where a valuable indication could be obtained at almost nominal expense. This appears to be a development and a potentially valuable operating expedient that merits active attention and encouragement.

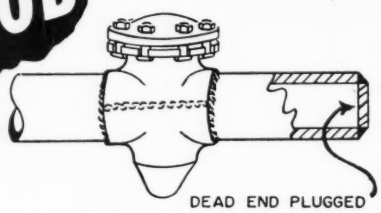
Industrial Atomic Energy

MOST people are aware, in a general sort of way, of the implications of the future practical applications of atomic fission, but think of it only rather vaguely as the major weapon in the next war (which they hope will not come for some time), and as a possible future source of industrial power and other peacetime energy. It is perhaps not generally realized that certain industrial and commercial applications may come very rapidly.

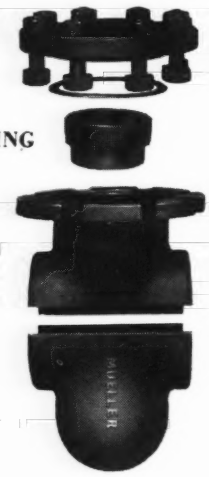
In a staff-written article in the March, 1947, issue "Chemical Engineering" states that the commercial production of electric power is only about five years away. Experiments at Oak Ridge, Schenectady and Chicago indicate that such power can be produced for eight mils per kwh, which production would be economical where coal costs $10 per ton. The article further states that while industry in general has shown little interest in the actual application of atomic energy, possibly feeling and realizing that such an all-powerful development must inevitably lead to socialization of atomic technology, General Electric Co. and Monsanto Chemical Co. are assuming a broad viewpoint and undertaking active research. General Electric is concentrating on generation of usable power from atomic piles. Monsanto is emphasizing the chemical problems such as production of isotopes, therapeutic radiators and medical tracers.

The FAST, SAFE AND ECONOMICAL METHOD

TO EXTEND DEAD ENDS



Any present Dead-End can be extended and no special provision need be made for extending Dead-Ends in the future. The Fitting is installed near the end and can always be used as a valve.



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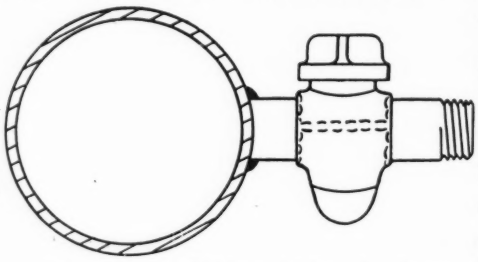
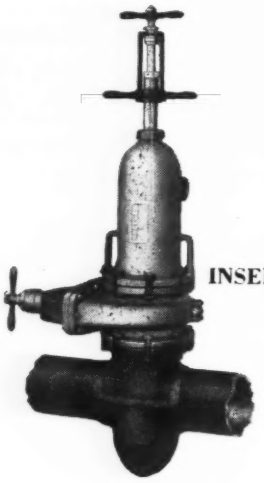


There is no problem in making any type of Lateral Connection with MUELLER Line Stopper Equipment and Fittings. It's economical too because you use a Fitting instead of an expensive valve.



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INSERTING MACHINE

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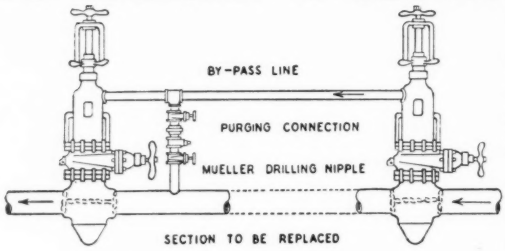
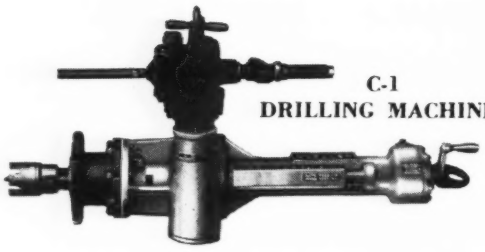


You can replace a section — repair a section and do a multitude of jobs that have piled up on you. You can By-Pass any section of line *without loss of gas or interruption of service.*



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MUELLER Line Stopper Equipment and Fittings can be used on Steel, Cast Iron or Copper Pipe with equal efficiency. The Fittings are installed at the exact location desired *without loss of gas, without interruption of service* and *with absolute safety.* Fittings, Equipment and Procedure are fully covered by U. S. Govt. Patents and are available for standard size pipe from 1 to 8 inches inclusive. For complete detailed information, write Dept. G. A. today.

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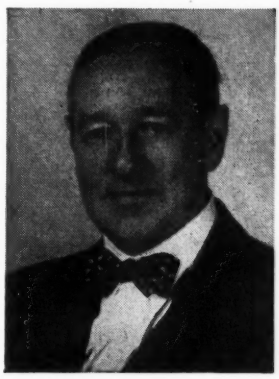
PROMOTIONAL NOTES AND NOTIONS

by Stanley Jenks

Wholesalers Stuck

A rather distressing item appeared in the gossip column of our local newspaper recently to the effect that "many local plumbing concerns are stuck with stocks of costly 'unsalable' gas heaters, because the gas company has been forced to bar installations for a year. . . . The small businessman is behind the eight ball in the situation.



"If he stores the units for a year, he pays fees and may take a beating in a deflated market. If he finds buyers in other cities, he takes a loss on shipping charges. One concern is reportedly holding the bag on two carloads of gas furnaces."

This is probably typical of many situations other than our local one. It is one of too many postwar maladjustments that are raising so much hob in all lines of business.

Whether the other fellow can be blamed is irrelevant now that the condition exists, and must be faced.

Obviously, the gas company isn't turning down business without good and sufficient reasons, and many a sales manager must be suffering the torments of the damned as he sees competing fuels taking business right out of his lap. The gas appliance distributor is also definitely on the spot, because he has a "dead" inventory on his hands. This is undoubtedly bad for public relations, and something needs to be done about the situation.

The obviously practical thing is to ship the equipment to those happy spots (e.g., Texas) where no shortage of gas or facilities exists. This suggests a compromise between the wholesaler and his manufacturer, with some sympathetic assistance from the gas company.

Another suggestion that has been made is that from a public relations viewpoint, and in the spirit of practical cooperation with the trade, the gas company should relieve the wholesaler of at least part of his inventory.

No matter what action is taken, somebody is going to have to take a loss. Perhaps "loss" is not exactly the right word. It might be better considered an investment in goodwill that might, and probably will, pay worth-while dividends later on.

Good Medicine

WHEN you have learned, through the years, to despise coal as a wasteful and dirty fuel, and you do a spot of gloating as you see it getting it in the neck competitively, you wonder how any gas salesman could feel otherwise. But some people evidently feel I have been rather too severe in some recent criticisms.

So to straighten out the record, let me say I sincerely feel that coal is one of our most valuable natural resources—too valuable, in fact, to be dissipated in ashes, clinkers, soot, and smoke for the sake of a relatively few effective Btu's.

Thanks to our scientists and chemists, coal is really black gold. Runge, for example, in 1834 discovered carbolic acid, a coal tar product, and every schoolboy knows what Lister, the father of modern surgery, did with carbolic acid. Perkin's discovery of aniline dye mauve—another coal derivative—really was the starting point of modern medicine.

Research with aniline dyes has led to the differential staining of tissues and the birth of chemotherapy. The red dye of prontosil and the malarial remedies mepacrine and paludrine depend for synthesis on coal-tar distillates. The synthetic analog of Vitamin K comes from naphthalene. Phenol is the chemical parent of aspirin and synthetic vestrogen stilboestrol. And so it goes. Doctors are very much indebted to coal. And their wives too, since nylon for their stockings is the same coal-based chemical that the doctor uses for his sutures.

Yes indeed! I have no antagonism to coal when used in a civilized and modern way, and not as a—but we won't go over that again.

Bee Oh

IT is to be assumed that the soap manufacturers are getting justifiable results with the hundreds of thousands of dollars they spend yearly with broadcasting companies for whispered innuendoes and direful ditties to persuade us to bathe oftener. The old foghorn rings the bell for us, because one of the hardest hurdles to get over in selling automatic water heaters was formerly the "Saturday night bath" habit. Maybe it still is.

Anyway, since personal habits govern so much of our wants and purchases, many an attempted automatic water heater sale has failed because the salesman did not diplomatically know how to tell the prospect that he needed to take more baths.

The radio is guaranteed to do this for him at least a dozen times daily. Bee-Oh!

Tax Axe

ANY argument that taxation is not detrimental to business is thoroughly disproved by the British plan under the budget submitted in April to the House of Commons by the Chancellor of the Exchequer.

The British wish to divert as much as possible of their production abroad, so they tax the heck out of their domestic sales.

The sales tax on most gas appliances, the exception being lighting and industrial equipment, was increased from 33.3 to 66.6% at the retail level.

The British gas appliance salesman (poor devil!) becomes a tax collector. Let's hope the Hottentots enjoy cooking with gas.

U. S. STANDARDIZED MECHANICAL JOINT CAST IRON PIPE

Original Woodcut by Lynd Ward

The advantages of U. S. Standardized Mechanical Joint Cast Iron Pipe are fundamental—long life; a bottle-tight joint; rapid and time-saving construction. A further advantage has recently been developed—*standardization.* Accessories and fittings furnished with U. S. Standardized Mechanical Joint Cast Iron Pipe are *interchangeable* with those supplied by all makers of standardized mechanical joint pipe. Obvious advantage of interchangeability is reduced inventory of accessories and fittings.

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General Offices: Burlington, N. J. • Foundries and Sales Offices throughout the U. S.

THERMALLY THINKING

Gas in Washington

(By S. H. Crosby, counsel, E. Holley Poe & Associates)

NOTWITHSTANDING their major legislative problems, the Interstate Commerce Committees of the two Houses of Congress have found time for preliminary consideration of important bills for amendment of the Natural Gas Act. The Rizley-Moore companion bills pending in both Houses call for comprehensive amendment of the Act and are supported by organizations representing the oil industry and the Independent Natural Gas Association. The Dolliver bill in the House is sponsored by coal-railroad-labor interests in their continuing endeavors to check the expansion of natural gas service. The Schwabe (House)-Moore (Senate) bills would grant the right of eminent domain enabling natural gas companies to which the Federal Power Commission issues certificates of public convenience and necessity to extend their pipe lines across lands of railroads and other obstructionists.

The Interstate Commerce Committee of the House, of which Rep. Wolverton (R., N.J.) is chairman, took the initiative, the whole committee attending hearings to consider the three bills before the House during the week of April 14.

On April 29, at a one-day hearing before a Senate Sub-Committee of which Sen. Moore is chairman, the House hearing record was summarized, and Chairman Smith of the Federal Power Commission read a prepared statement asking that the Congress defer action upon major amendments of the Natural Gas Act until the commission reports to Congress its own recommendations resulting from its G-580 Gas Investigation. It is the consensus of neutral observers that Chairman Smith's logical and persuasive statement has quenched industry plans for jet propulsion of its amendments through this session of Congress. He stated:

> Barring unforeseen difficulties or interruptions . . . the final report should be ready for submission to the Congress early in the autumn.

Protesting against Congressional action "in an atmosphere of seeming haste and urgency," Chairman Smith alluded to a recent AGA report that the natural gas industry enjoyed gross revenues in excess of $700 million in 1946 and remarked:

> A survey of conditions within the natural gas industry discloses no such need (for "immediate action . . . urgently required for the survival of the industry"). Far from being in dire straits calling for heroic measures of relief, it would be hard to find a more lusty, growing industry.

In the process of producing the report to Congress, a major task involving a 15,000-page transcript of oral testimony and 500 exhibits accumulated in the G-580 Gas Investigation, the commission has submitted a number of sectional staff reports to those actively participating in the hearings, Chairman Smith states:

> One of these reports is directed squarely to the commission's authority under the Natural Gas Act with respect to those who produce and gather gas in the field. On this matter, concerning which there has been so much agitation and expression of fear, the report states clearly that the jurisdiction of the commission does not extend to control of these operations. Since the issuance of this report, moreover, the commission has been perfecting for publication pursuant to the Administrative Procedure Act a proposed administrative rule, intended for official adoption as its interpretation of Section 1(b) of the Act, *declaring unequivocally its interpretation of that section as exempting from its jurisdiction arm's length sales made by producers and gatherers to interstate transmission pipe line companies. This is the position which is stated plainly also in the commission's brief on the merits before the Supreme Court in the pending Interstate Case* . . . (Italics supplied)

The case of *Interstate Natural Gas Co. Inc.* v. *Federal Power Commission*[9] . . . has been used to raise widespread alarm among oil and gas producers and to gain support for amendatory legislation not so much, apparently, because of the commission's conclusion that it had rate jurisdiction on the particular set of facts presented, as on account of certain inferences drawn from legal language used in sustaining this conclusion.

[9]156 Fed. 2d 949 (1946).

A few days after Chairman Smith presented his 50-page statement before Sen. Moore's committee, the Interstate case was reached for hearing in the Supreme Court. Both majors and minors in the oil industry had been thoroughly aroused by the decision of the Fifth Circuit Court of Appeals following closely upon the Supreme Court decisions in the Canadian River-Colorado Interstate and Panhandle Eastern cases, from which the late Chief Justice Stone and three Associate Justices dissented vigorously. In the light of the judicial record, Chairman Smith's explanation quoted above, is an understatement when he attributes industry alarm to "certain inferences from legal language." As "friends of the court" the American Petroleum Institute, Independent Petroleum Association, Mid-Continent Oil and Gas Association and Independent Natural Gas Association literally and successfully importuned the Supreme Court to review the Louisiana Interstate case. The States of Texas and Oklahoma were represented in argument.

Interstate Natural Gas Co. of Louisiana is a pioneer gas producer in the Monroe field. It is engaged in three distinct businesses. Its principal pipe line extending from the Monroe Field in Northern Louisiana to the Baton Rouge area passes through a corner of Mississippi. The company supplies various Louisiana distributors and is therefore a natural gas company engaged in selling natural gas for resale in interstate commerce. This part of its business is admittedly subject to Federal Power Commission jurisdiction. The company also makes large direct sales to industries at Baton Rouge. The commission claims no jurisdiction over these.

The controversy arises over sales of natural gas to Mississippi River Fuel Corp. Interstate contends that the gas it sells is produced or purchased by it and gathered by a maze of pipe lines which deliver the gas to scrubbers through which it passes into the compressor station of Mississippi River Fuel Corp. The gas is metered and paid for at this station, which is admittedly within the Monroe field, and the purchaser's pumps there start the gas on its interstate transmission to St. Louis.

Sec. 1(b) of the Natural Gas Act excludes "production and gathering" from FPC jurisdiction, but since Interstate necessarily *transports* great volumes of gas considerable distances before delivery to Mississippi River Fuel, FPC contends that although Interstate's gathering system

is all within the Monroe field, where the gas was produced, there was a continuous movement of the gathered gas to the compressor station which constituted *transportation in interstate commerce.* However, *the cost of Interstate's entire gathering system,* including the large lines required to make deliveries of *gathered* gas—both produced and purchased—into the compressor station of Mississippi River Fuel, *is set out in detail in compliance with FPC's Uniform System of Accounts, and the accuracy of the company's classification had been checked by FPC engineers and accountants.*

Bearing in mind Chairman Smith's statements before the Senate Committee explanatory of FPC policies concerning the extent of its jurisdiction over field operations, certain parts of the argument of Assistant General Counsel Charles E. McGee are informative. Members of the court evinced keen interest in ascertaining the commission's view about the exact boundaries of its power.

Responding to a question from Mr. Justice Rutledge, Mr. McGee stated:

> We say that all the *activities* of a producer and gatherer are exempt from the jurisdiction of the Federal Power Commission; that sales made by an independent producer or gatherer, in the field, exclusive of transportation—because there could be transportation after the completion of production and gathering—that those sales would be exempt from the Federal Power Commission.

In a lengthy colloquy with Mr. Justice Frankfurter the discussion came down to this:

MR. JUSTICE FRANKFURTER: The question of completion of gathering: does that confine it to its physical content?

MR. McGEE: On the question of where gathering ends and transportation begins? *I think really that is a question of fact to be determined in each case. I think that no hard and fast rule can be enunciated by the commission or by the courts which can be applicable in every case, and under all circumstances.* I think we must recognize that some gathering operations of a producer and gatherer or of a company otherwise a natural gas company may be somewhat complex, so that *the determination of whether there is transportation in the jurisdictional sense may have to vary somewhat according to the facts of the case.*

MR. JUSTICE FRANKFURTER: Well, with reference to what?

MR. McGEE: I think if I give you an illustration, I would be able to answer your question more intelligently, Mr. Justice Frankfurter. Assuming that you have an independent producer and gatherer, and he produces and gathers gas from several wells in the field, when he gets to the last well we can assume that he has completed gathering the gas from all of the other wells. And then, of course, there is some slight transportation involved, naturally, after the completion of gathering from the last well. But if that independent producer then transports the gas and then makes a sale for resale, he is subject to the jurisdiction of the Federal Power Commission.

MR. JUSTICE FRANKFURTER: After he has completed the physical gathering?

MR. McGEE: If the physical gathering is completed, and the sale is made at or near that point, that is not subject to our jurisdiction.

MR. JUSTICE FRANKFURTER: I just want to know if that is so, and what facts make the difference. Is there periphera or is there any zone there beyond which, when the physical fact of gathering is completed, the man is subjected to jurisdiction?

MR. McGEE: I would say that the physical gathering is complete when the producer has completed the gathering of the gas from its field system, and there is no more gathering involved. I think that is about as close as you can come to it, Mr. Justice Frankfurter.

MR. JUSTICE RUTLEDGE: Then, you would say that he would have to get rid of it substantially at one of the wellheads?

MR. McGEE: Not necessarily.

MR. JUSTICE RUTLEDGE: That he has got to gather it at that point; that he cannot have any gathering at any point where there is not the last of the wells?

MR. McGEE: Well, of course, if this transportation—and the commission wants to assume jurisdiction over the act of that independent producer who produces and gathers and then transports—it is probably a matter of degree, and that is why I stated a moment ago that it is difficult arbitrarily to draw a line and say from that point on the commission will assume jurisdiction in every case.

MR. JUSTICE REED: Your opponents, as I understand it, state your position for you, and they say that the Power Commission takes the position that gathering ceases when the last in-flow comes from a well into the pipe line. Now, you deny that position, do you?

MR. McGEE: No, I do not deny it, because the gathering operations, if you have 20 wells in a line, and you get down to the 20th well, and all the gas is then completely gathered—there may be some transportation—you would have to have it because you have a complicated field system—but at or near that 20th well, the gathering operation of that producer or gatherer has been completed.

MR. JUSTICE REED: What is it? At or near does not help me very much. Does that mean anywhere in the field, so that having gathered from your 20 wells—say all of them are in the northern part of this field—and then carrying all of that gas to the Memphis line and delivering it to it 20 miles away?

MR. McGEE: No, sir, that is transportation in interstate commerce and subject to the jurisdiction of the Federal Power Commission.

MR. JUSTICE REED: So if the Memphis line took it half a mile away from your 20th well, then, the Power Commission would have nothing to do with it and could sell it for whatever they pleased?

MR. McGEE: Yes, sir.

MR. JUSTICE REED: But if he went 20 miles, he could not?

MR. McGEE: That seems to be the indication of the legislative history. . . .

MR. JUSTICE REED: . . . As I understand you now, you are saying that the mere fact that the gatherer has to transport the gas to a convenient point for sale brings him under the authority of the commission in the sale.

MR. McGEE: Well, of course, the ordinary practice for the company is to go to the field and pick up the gas. But if an independent gatherer has to do that which you state, Mr. Justice Reed, and that independent producer and gatherer, in order to dispose of his gas, does engage in that 20 miles of transportation, I think that is transportation within the meaning of the Natural Gas Act.

Highlights

PRESIDENT TRUMAN EARLY LAST MONTH NOMINATED BURTON N. BEHLING, special assistant to the Federal Power Commission, to the post of commissioner vacated by Richard Sachse. Behling attained prominence as director of the FPC's Natural Gas Investigation, Docket G-580. He had served as special assistant to the commission since September 1944. His nomination would run for the remainder of Sachse's unexpired term and for the five-year term ending June 22, 1952. Sachse's resignation was caused by ill health.

THREE APPLICATIONS WHICH, IF APPROVED BY THE FPC, WILL MATERIALLY EXPAND THE FACILITIES OF THE NORTHERN NATURAL GAS CO., WILL BE HEARD IN WASHINGTON JUNE 16. Two are consolidated rehearings of previously submitted applications, the third is a request for a $24.5-million extension of equipment designed to increase the company's capacity to 580 Mcf per day. The first named applications concern proposed construction to enable delivery to be made to Iowa Electric and Power Co. for fuel requirements at its electric generating plant at Boone, Iowa, and to extend service from the Boone-Ames pipe to Marshalltown, Iowa, with intervening connections to Colo and State Center. Construction desired in the new docket includes a 10,000-hp compressor at Garden City, Kan.; 320 miles of 26-in. line to Palmyra, Neb.; 254 miles of 24-in. line to complete partial looping past Palmyra, and other line and compressor additions. Intervenors here include five unions, Koppers Co., Inc., and National Coal Association.

ECONOMY-MINDED EXECUTIVES IN THE OIL AND GAS INDUSTRIES FOUND THEMSELVES IN AN ANOMALOUS POSITION LAST MONTH when the House voted to lop off a sizeable sum from the budget of the Oil and Gas Division of the Department of the Interior. Walter S. Hallanan, chairman of the National Petroleum Council and a Republican National Committeeman from West Virginia, told the Senate Appropriations Committee that the House had rejected a sizeable appropriation under a "wholly false conception" that the division serves only the petroleum industry. Meanwhile, Director Max Ball gave severance notice to 15 war service employees and non-pay furloughs of one month to 17 field men, but announced continuance of as many activities as possible until July 1. After that date, seven operating committees will be abolished. Drastic curtailments also faced the Bureau of Mines, whose allotment was trimmed $6 million.

FIFTEEN MILLION DOLLARS—that was the increase in the 1945 net income of natural gas companies subject to FPC jurisdiction, according to data in "Statistics of Natural Gas Companies—1945," issued last month by the commission. That year's totals hit $107.4 million in comparison with 1944's $92 million. Customers served likewise increased from 3,676,189 to 3,877,394. Included in the survey were 111 companies.

IT'LL BE ATLANTIC CITY AGAIN IN '48 for the AGA convention. The recommendation of the Time and Place Committee, headed by Alfred Hirsh, Laclede Gas Light Co., St. Louis, was approved at the Executive Board meeting in Milwaukee, April 28, and will be ratified at the 1947 convention in Cleveland. Such early action—ordinarily such action would be deferred until the convention in Cleveland—was thought wise in view of hotel accommodation shortages.

CHARGES BY CERTAIN CALIFORNIA OIL COMPANIES that Southern California Gas Co., Pacific Lighting Co., and Pacific Gas and Electric Co. were shunning available gas produced in the state while bringing in Texas gas at "enormous cost to consumers" were branded as untrue. Roy M. Bauer, Southern Cal's supply superintendent, stated that at least one of the producers had refused to enter into "conservation arrangements" with the result that if the gas were taken the wells would be depleted within a matter of months.

IN LOUISIANA, CONSERVATION COMMISSIONER JOSEPH MCHUGH HAS SIGNED ORDERS authorizing recycling operations estimated to save more than 18 MMcf per day. Such projects, one of which—a plant in Lake St. John field—is scheduled to start this month, will reduce the state daily flare gas total to 200 MMcf.

BROOKLYN UNION GAS CO. LAST MONTH WAS SEEKING A RATE INCREASE. In its application to the Public Service Commission of New York, Controller J. A. Patterson declared that a payroll increase alone will cost $1,546,000 this year. The company is seeking boosts which will aggregate an estimated $1,900,000.

REGULATIONS TO MINIMIZE EFFECTS OF NEXT YEAR'S EXPECTED GAS TRANSMISSION SHORTAGE throughout the Midwest states were proposed at an open hearing conducted by the FPC in Chicago May 7. Commissioner Leland Olds stressed the need for larger volume storage during the summer, and said that aid of the gas industry in working out ways to minimize the shortage will be sought. Representatives attended from Illinois, Michigan, Ohio, Indiana, Missouri, Kansas, and Kentucky.

REDUCE

GAS PILOT "OUTAGES" WITH

PATROL GUM FILTERS

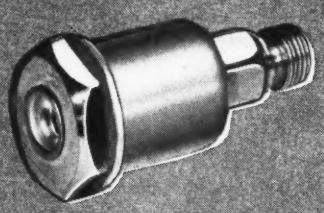
● Pilot Light Outages on Automatic Gas Appliances are aggravating to owners and result in costly service to the utilities, dealers and manufacturers.

When clogging of ports by GUM, dust, dirt, or other foreign matter in the gas is responsible, repeat service calls are in the offing unless some positive preventive means is employed.

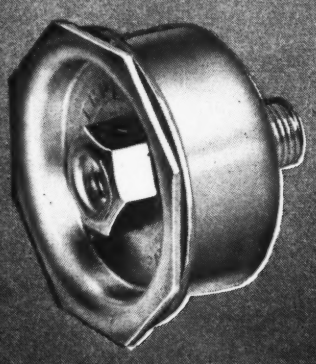
Such a means—simple, sure, and inexpensive—is installation of a PATROL GUM FILTER in the pilot line. *These filters are listed by the A.G.A., which requires pilot filters on many appliances for use with manufactured gas.*

PATROL GUM FILTERS are made with a wide range of capacities (five sizes) and for all types of applications. The models illustrated are but two of the many available for the improvement of gas appliances and gas service to the consumer.

Decide now to *CONTROL with PATROL* the *dust, dirt and GUM* that so often interrupt gas pilot operation. Send for full-line specifications and prices today.



No. 1 GUM FILTER



No. 5 GUM FILTER

FEATURES OF PATROL GUM FILTERS

1 Pilot clogging and outages caused by vapor-phase gum are reduced to a minimum with the use of PATROL GUM FILTERS.

2 In addition to the primary purpose of the filter (to remove gum) it also serves to remove dust and other foreign material. This incidental advantage contributes to the trouble-free performance obtained from filter-protected equipment.

3 PATROL GUM FILTERS utilize a special filtering material capable of removing gum particles as small as 0.00001 (one-one hundred thousandth) inch in size without unduly impeding the flow of gas to the pilot.

4 Laboratory checking, combined with field observations, indicates that under normal conditions an average filter life of at least 10 years will be attained.

5 THE PATROL VALVE CO. manufactures the largest selection of approved gum filters, covering a wide range of capacities and applications to all types of pilots of gas burning appliances.

6 PATROL GUM FILTERS are compact in design and their cost is nominal.

7 PATROL GUM FILTERS are approved by the A.G.A. and U.G.I. Testing Laboratories.

The PATROL Valve Co.

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Utilities—
Manufacturers—
Sample Patrol Gum Filters
Sent Upon Request

Pilot and Control Stoppages

In Manufactured Gas Systems

By N. H. GELLERT, JR.

Utilization Manager,
Seattle Gas Co.

IN SIX PARTS

1. **Removing stoppages from pilots and controls.**
2. **Accessories for retarding stoppages in pilots and controls.**
3. **Removal of undesirable constituents from gas by distribution control.**
4. **Removal of undesirable constituents of gas at the source.**
5. **Necessity of manufacturing gas with undesirable constituents.**
6. **A properly balanced program for the reduction of pilot and control stoppages.**

1. Removing Stoppages from Pilots and Controls.

Any discussion of the removal of stoppages from pilots and controls must include a thought about their accessibility within the particular appliance. Generally speaking, high quality appliances of old, established firms will be found to be more accessible than appliances of less well-known firms. Evidently this is because it takes superior engineering and more careful construction to make an appliance "get-at-able." This factor bears considerable weight in manufactured gas companies.

Are there certain types of controls which seem to be more susceptible to stoppages than others? Let us consider, for example, a modern range with an oven lighter of the constant burning type. The small orifice through which gas passes 24 hours a day may be a trouble spot and a stoppage will necessitate removal of the pilot burner by a serviceman. Another range equipped with an oven lighter of the cycling type is actually more complicated, but the small orifice in the pilot burner is passing gas only one or two hours per day or even less with a correspondingly longer period between stoppages. The small luminous flame pilot which lights the pilot burner may go out due to pilot valve stoppage, but the serviceman or even the customer can remedy this situation in a few seconds. Certain types of controls *are* more susceptible to stoppage than others and manufactured gas companies must be constantly on guard to weed out undesirables.

The actual removal of stoppages is obviously a most direct method of dealing with the problem. The use of small, stainless steel spring wire in cleaning pilot orifices, the bicycle pump technique and the use of tetralin and other solvents for dissolving and removing gum are procedures familiar to most servicemen. The use of small drills and reamers in cleaning pilot orifices is also unfortunately familiar to that same group and has resulted in needless replacements.

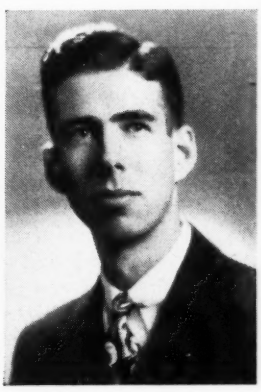
2. Accessories for Retarding Stoppages in Pilots and Controls.

When the problem of pilot stoppages became acute in the early 1930's, the dust filter was the only accessory that the industry could turn to for protection. For manufactured gas companies, this was small protection indeed. Theirs was not a dust problem, but a gum problem, and the conventional filter was practically useless. A partial answer to this problem seemed to come in 1933 with the development of the "Non-Stop Pilot Control." This device, consisting of a series of spiral-grooved discs, was designed to slow down the gas as it flowed to the pilot so that the necessary reduction in pressure would not occur sharply and therefore would not deposit vapor-phase gum on the pilot valve. The Non-Stop Pilot Control was not an unqualified success, and none has been manufactured for many years.

The introduction in 1937 of the UGI vapor-phase gum filter filled the gap the Non-Stop Pilot Control had failed to fill. The AGA has made very complete tests of the effectiveness of the UGI filter in protecting pilots against vapor-phase gum, and has announced it to be completely effective. AGA-approved gum protective devices are available in capacities of ¾ cu. ft. per hour to 10 cu. ft. per hour. Although these filters will not allow either vapor-phase gum or dust to pass through them, it is evident that severe gum conditions will shorten the useful life of the filter and may cause stoppages in thermostat valves and other controls through which the gas flow is too great to be filtered. This thought has already occurred to one manufacturer who now advertises a filter for vapor-phase gum with capacities up to 80 cu. ft. per hour.

Although the dust problem for most manufactured gas companies is not as great as for natural gas companies, the dust filter has found a place in services and appliance lines for protection of hard-seat valves in many controls.

Presented at Utilization Conference, Pacific Coast Gas Association, Feb. 27.



UPON GRADUATING from Yale in 1937, Mr. Gellert obtained employment with the Central Fuel Corp., Chicago, wholesale coal distributors. Two years later he began his career in the gas industry.

The distribution and utilization problems of small gas companies were made familiar to him through his association in various capacities with the Great Lakes Utilities Co. and the Atlantic Gas Corp. in Eastern and Mid-Western gas properties. Two years as manager of the North Carolina Gas Corp. in Reidsville and Lexington and two subsequent years as president of the Atlantic Gas Corp. and subsidiaries preceded his migration to Seattle in 1945.

He is the son of N. Henry Gellert, president, Seattle Gas Co.

TABLE 1. STEPS TO TAKE TO REDUCE STOPPAGES

1. The sale and promotion of those types or makes of appliances that have proved to be least susceptible to pilot and control stoppages.
2. The use of gum filters on pilots and dust filters on fuel lines and services where needed.
3. A tightly operated program of patrolling drips, with constant attention to the amount of liquid removed from high pressure drips in relation to the drip capacity.
4. Chemical control over H_2S and NO at the dry boxes and a realization of the value of the holder in reducing NO.
5. The development of a by-product market so that the removal of gum formers and naphthalene will be a profitable enterprise.
6. The avoidance, where possible, of the original production of materials known to be harmful.

3. Removal of Undesirable Constituents from Gas by Distribution Control.

The distribution man, through observation of the material taken from high and low pressure drips, becomes aware of impurities in the gas, such as tar, water, oil, gum and dust. The fact that these materials can be withdrawn from drips is indication that they have been dropped from the gas. Many a manufactured gas man has had the experience of blowing a high pressure drip weekly and removing, say, 100 gal. of water and drip oil, only to change the routine and blow the same drip daily and withdraw 50 gal. per day. Such experiences emphasize the fact that, roughly speaking, if the drip truck doesn't remove the liquids from high pressure mains, the gas will. In many cases, a high pressure line may serve the purpose of a compressor aftercooler. Properly drained to a drip tank of adequate capacity, the use of such a line for the purpose of removing undesirable constituents in the gas may often be economically desirable.

Manufactured gas companies have experimented with various methods of making main drips more effective. Oil fogging and tetralin injection have been tried as means of holding gum and gum-forming materials in solution until they could be removed from the drips. The results of these efforts have evidently been spotty, with some good and some poor.

An effort has been made by the Seattle Gas Co. to find an inhibitor which would actually prevent the formation of gum in the gas after leaving the plant. Under the direction of George Thayer, superintendent of production control, experiments were conducted with three inhibitors manufactured by the Universal Oil Products Co. Although these inhibitors are produced for the purpose of preventing the formation of gum in gasoline, Mr. Thayer had hoped at least one of them would be suitable for a similar use with gas. The results of these experiments indicate that the addition to the gas stream of any one of these U.O.P. inhibitors would be impractical, if not wholly impossible.

4. Removal of Undesirable Constituents of Gas at the Source.

What are some of these undesirable constituents and why are they undesirable?

Sulphur — Organic. Corrosion of copper has been observed to occur as a reaction with mercaptans in manufactured gas. Page 107, "Fuel Flue Gases," says:

> It was noticed that a series of scales was formed on the surface of the copper. They were brittle and could be flaked off . . .

Sulphur — Inorganic. The formation of sulfides in metal tubing as a result of contact with hydrogen sulfide has been universally noted. Serious stoppages in orifices and controls can result from the presence of H_2S in manufactured gas.

Naphthalene. Small amounts of naphthalene can cause complete stoppage of high pressure service regulators. The presence of gum aggravates the difficulties caused by naphthalene.

Liquid-Phase Gum. The resinous material that sticks regulators, thermostat valves and furnace control valves begins life as a light oil with a tacky residue and develops into sticky gum.

Vapor-Phase Gum. The undesirability of this has already been discussed.

How can they be removed at the source?

Sulphur—Organic. Methods of considerable complexity have been devised for the removal of organic sulphur. The Hall process was used at Portland, Ore., for a number of years. Some organic sulphur is removed by conventional oil scrubbing apparatus in most manufactured gas plants. The gas conditioning committee of the AGA is continuing an exhaustive study on the problem of organic sulphur removal. Extensive use of any process for complete organic sulphur removal by manufactured gas companies seems to be a number of years away.

Sulphur — Inorganic. Fortunately, the means for solving this problem have been available for many years.

Naphthalene. Most gas plants with a naphthalene problem have provided the means of removing it as a by-product. Tar scrubbing or absorption by oil, or both, are commonly practiced.

Liquid-Phase Gum. The source of liquid-phase gum is somewhere between the gas making set and the customer. It is not actually manufactured as such, but is formed by condensation and consequent evaporation of heavy unsaturated hydrocarbons present in the gas and by polymerization and oxidation of those hydrocarbons. Oxygen is therefore a factor in the formation of this type of gum. The possibility that these heavy hydrocarbons themselves may cause pilot port stoppages due to cracking near the heat of the flame might merit some study.

Oxygen can be removed completely from gas only by elaborate processes. Partial removal is effected by an electric gas treater as an incidental result in the removal of NO from gas. Varying amounts of oxygen are removed in the process of dry-box purification.

The heavy hydrocarbons which form liquid-phase gum can be largely removed by oil or creosote absorption in conventional apparatus. Removal of 98% of gum formers has been reported in industry publications. In plants where oil scrubbing capacity is inadequate, creosote is reported to increase scrubbing capacity.

Vapor-Phase Gum. By reaction of butadiene and similar compounds with oxygen and oxides of nitrogen, vapor-phase gum is formed after the gas has left the gas making set. The removal of the gum inself and of the gases that react to form the gum is one of the most elusive problems confronting a manufactured gas plant. A typical cycle of events might be as follows:

The gas as manufactured, containing butadiene, NO and O_2, flows to a relief holder. There the process of gum formation begins. Some gum particles drop out into the holder tank and into the drips.

The gas is passed through purification boxes containing iron oxide. Iron oxide itself is of little or no value in removing any of the three guilty gases, but iron sulfide is effective in removing NO and O_2. It can thus be seen that conditions which are best for removing NO are worst for removing H_2S and that the removal of oxygen at the same time NO is being re-

moved tends to "sweeten" the purifying material and make it less effective in removing NO. Obviously, in plants without elaborate chemical control, the amount of NO removed by dry box purification varies between wide limits.

Finally the gas reaches the storage holder where the gum forming reaction continues and presumably would be completed if enough time elapsed so that the total amount of one of the necessary ingredients were used up in the reaction. Generally, however, the gas leaves the holder before the necessary time has elapsed and gum continues to form in the distribution system. It is interesting to note that in a well-regulated plant such as the Rochester Gas and Electric Co., the dry boxes are made to remove about 80% of the total NO in the gas and that 80% of what is left is removed by reaction in the holders. Not all the gum formed in the holder, however, will be deposited in the plant and a varying amount will be sent out into the distribution system.

An electric gas treater in use at Everett, Mass., removes as much as 99% of NO from mixed coke oven and carburetted water-gas and allows substantially all the gum formed in the reaction to drop out of the gas within the plant. In this process, the oxidation of NO to NO_2 is accelerated by the use of a brush type corona discharge, permitting the swift formation of vapor-phase gum. However, the maintenance of this electric unit is expensive and difficult, as pointed out by Warren Churchill in "Gas Age," Nov. 19, 1942.

> . . . the two units require cleaning at the end of a 90-day period. The hard deposit of scale and gum which forms on the points of the discharge electrodes and on the smooth ground plates is removed with wire brushes. This is a tedious job because of the many points and small clearances involved. Approximately 40 wire brushes are worn out by four men during the cleaning period (eight to ten days).

Oxygen is a necessary constituent in the formation of vapor-phase gum and its removal from the gas has been mentioned.

Butadiene and similar compounds which react with NO and O_2 in manufactured gas to form vapor-phase gum are fortunately susceptible to the same methods of removal as that class of unsaturated hydrocarbons which react to form liquid-phase gum. Thus scrubbing for liquid-gum formers will remove a comparable percentage of vapor-phase gum formers.

It can reasonably be expected that most manufactured gas utilities, by exercising close control over conventional processes, can reduce the amount of vapor-phase gum passing into the distribution system.

5. The Necessity of Manufacturing Gas With Undesirable Constituents.

We have discussed the possibility of removal of those constituents of manufactured gas which cause pilot and control stoppages. Is there also a possibility of avoiding the original production of these materials?

Sulphur — Organic and Inorganic. Since sulphur is an element present in the fuel from which gas is made, there can be no possibility of halting production of sulphur compounds.

Naphthalene. The production of naphthalene is dependent largely upon the type of gas-making apparatus in use in any given plant, and changes in operating procedure, within the limits of good practice, will have only a minor effect on the amount of naphthalene produced.

Gum Forming Hydrocarbons. There is no commercial gas-making process which can add sufficient hydrogen under the proper conditions to avoid the production of unsaturated hydrocarbons. In general, however, in plants using oil for gas generation, it is considered that less gum-forming hydrocarbons are produced at high temperatures than at low temperatures. Thus an oil-gas process which produces carbon as a result of the high temperature cracking of oil should produce less gum formers per gallon of oil than a water-gas plant cracking oil at lower temperatures.

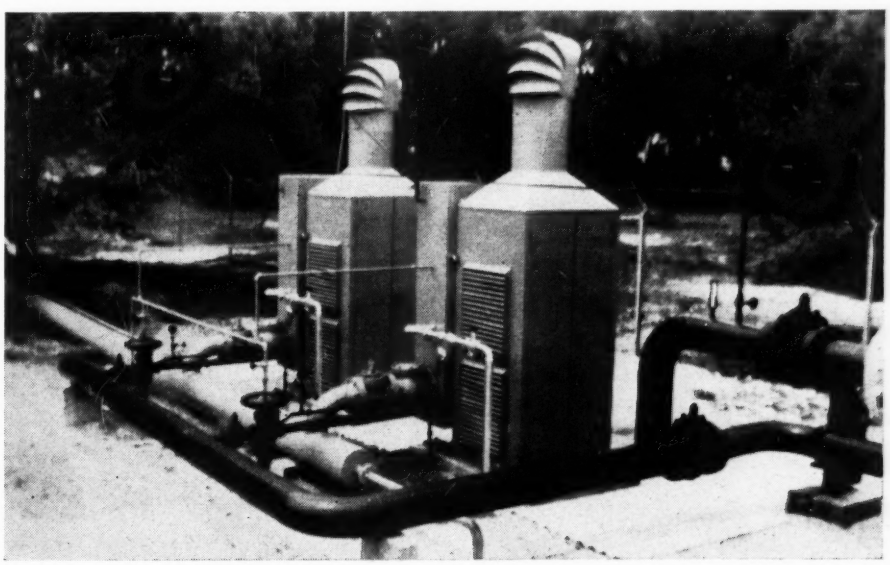
Nitric Oxide. The problem of eliminating nitric oxide is simply the problem of eliminating all combustion products from the gas, as NO is formed in the combustion process. Gas-making cycles which reduce or eliminate the blow run or purge run will contribute to the elimination of NO.

Oxygen. The elimination of combustion products would naturally result in the reduction of free oxygen which usually accompanies combustion products. However, the complete elimination of oxygen in the manufacturing process is seldom, if ever, achieved.

6. A Properly Balanced Program for the Reduction of Pilot and Control Stoppages.

Going back through our outline, we can pick our way through the steps that will enable the manufactured gas utility to reduce pilot and control stoppages to a minimum. (*See Table 1.*)

It is evident that none of the procedures we have discussed is 100% effective against pilot and control stoppages. But it is also evident that by approaching the problem from all possible angles, a manufactured gas utility has a good chance of reducing such stoppages to the point where they do not constitute a major problem, either in cost of service or in the public acceptance of gas.

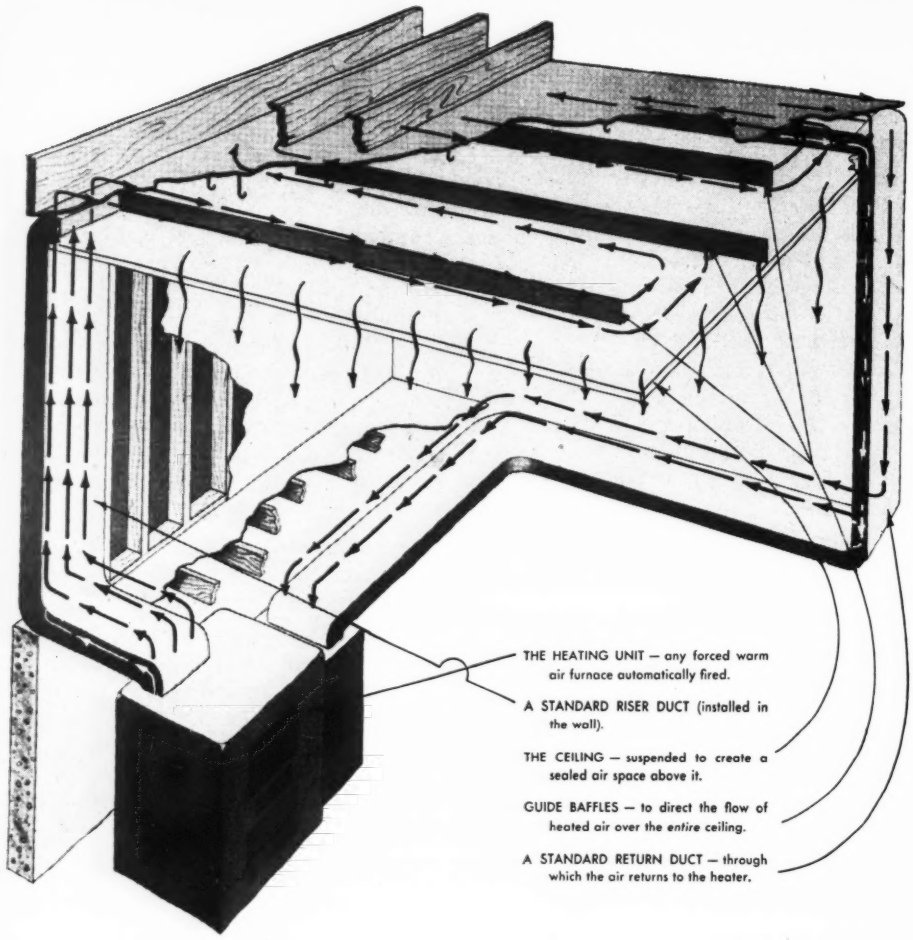


Propane gas-air, produced by the "Gasair" machines pictured here, has replaced water gas in DeLand, Fla. Each of the machines delivers a capacity of 25,000 cfh. Previous to their installation, the company served 525-Btu gas at 35 lb., but the new machines make it possible to mix 1000-Btu gas under a 20-lb. pressure, thus doubling sendout without altering the distribution setup of small-diameter lines. High pressure system is necessitated by the 15-mi. distance traveled by the lines from the source of supply. The machines were engineered and installed for Florida Power Corp. by Pacific Gas Corp.

Panel Heatin

By H. F. RANDOLPH

Vice Pres., International Heater Co., Utica, N. Y.


THE HEATING UNIT — any forced warm air furnace automatically fired.
A STANDARD RISER DUCT (installed in the wall).
THE CEILING — suspended to create a sealed air space above it.
GUIDE BAFFLES — to direct the flow of heated air over the *entire* ceiling.
A STANDARD RETURN DUCT — through which the air returns to the heater.

FOR many decades home owners have purchased heating systems on the sole guarantee that they were adequate to maintain an indoor temperature of 70° F at a given outdoor temperature of—10° F, or whatever the local design temperature might be. What these home owners intended to buy were systems that would produce comfort at the stipulated outdoor temperature. But as air temperature alone does not determine comfort, what the home owner bought and got were often two different things.

As the human being is a heating system in itself, the winter comfort function of an enclosure is not to warm the body but rather to balance the body heat loss with its heat generation.

The average heat generation of the normal sedentary adult is about 400 Btu per hour, which must be dissipated as fast as it is generated if health and comfort are to be maintained.

The hourly body loss by respiration and evaporation is about 90 Btu, and it is known that if the remaining 310 Btu can be lost at the rate of 120 by convection to the air enveloping the body and 190 by radiation to the surrounding surfaces, a sensation of comfort will result. Experience has shown that deviation both ways from these values may be made but the limits are not yet definitely established.

There is no fixed condition that produces universal comfort because metabolism varies with age, sex, race and activity. A child is comfortable in temperatures that feel cool to an elderly person. A female requires a lower temperature environment than a male with equal clothing insulation, a person at rest gives off less heat and must be surrounded by higher mean temperatures than one who is active. However, it is known that in an environment of 70° F—that is, mean radiant temperature at 70° as well as air temperature at 70° F—a condition of comfort results for the average person and such a condition is what every residential heating system should be designed to produce.

Convection

With conventional systems of heating, the air within the room or house is warmed by passing over a heated surface such as a steam or water radiator within the room or a furnace which is generally in the basement. This heated air is then moved about the room by natural or mechanical means so that it contacts the cooler surfaces warming them by convection. With such systems the mean air temperature is generally higher than the mean surface temperature.

Although the inner wall surface temperatures lag behind, they do follow the pattern of outdoor temperatures. As the weather gets colder the inner mean radiant temperature is depressed, resulting in a greater heat exchange from the human body by radiation, and necessitating a higher air temperature to balance the total body heat loss.

That, of course, is the reason why in colder weather an air temperature of 76° or 78° F may often be required for comfort while 70° or 72° F will produce an equal degree of comfort in mild weather.

It is obvious that the ideal heating system would be that which would maintain the one uniform constant temperature level necessary for comfort under all external conditions. With such a system, no temperature adjustments would ever be necessary. The relation of humidity, air movement, air temperature, and surface temperature would be such as to produce an invigorating atmosphere free from objectionable drafts which often accompany convection heating, free from oppressively high air temperatures often necessary in severe weather, free from the odors resulting from the breakdown of dust particles contacting high temperature surfaces, and free from the irritation of low relative humidity which accompanies high air temperature.

Such perfection may never be reached but a combination of better construction and better means of introducing heat will produce a decided improvement over past performance. This, of course, brings up the very academic point that a heating system of itself can never produce comfort. This can only be accomplished when the heating system and the structure are considered as a

Presented at Midwest Power Conference, Chicago, March 31.

— With Air

whole. Hence, a heating system should not be blamed for a deficiency in the structure. Just as a crude example, an excess amount of radiation will not overcome an objectionable draft from a poorly fitted window.

Air and Surface Balance

Knowing, then, that an air temperature of 70° F and a surface temperature of 70° F will produce comfort regardless of external conditions, we strive for that end result. Regardless of the means of introducing the heat, the surface temperature of any structure will increase as the heat transmission rate of the structure drops. Weather stripping which reduces the volume of infiltrated air, double glazed windows that increase the inner surface temperature of the glass, and insulation that increases wall surface temperatures, all help to increase the mean radiant temperature, necessitating a reduction in the air temperature required to balance body heat loss.

The reduction in air temperature that is made possible by improved construction is compounded by the resultant increase in relative humidity. With a given amount of water vapor present the relative humidity will be higher for three reasons: first, because the air temperature is lower; second, because the infiltration, which normally requires a lot of moisture, is reduced; third, because the insulation vapor seal practically eliminates moisture migration through the walls. The net result of all this is to elevate the relative humidity to a point such that body heat loss by respiration and evaporation is reduced, necessitating a further lowering of the air temperature to maintain balance.

If to these improvements in construction the means of heat introduction is reversed, and instead of the heated air warming the structure, the structure is heated first and the air warmed by the surfaces of the room, then, theoretically at least, one constant surface and air temperature will result and produce a comfort environment. That is the aim of panel or so-called radiant heating.

Panel heating is possible because of the fact that the infra-red ray passes through clean dry air without warming it and has no effect until it strikes a solid object which absorbs the ray, is warmed, and reradiates its energy. The structure is therefore warmed first and it in turn warms the air. In a building such as a house, with no means of artificial ventilation, the air temperature practically equalizes with the mean radiant temperature, making possible a single control temperature that produces comfort under all external conditions.

Obviously no system is wholly radiant any more than any system is wholly convective, but, by increasing the area of the heated surfaces and decreasing their temperature, the percent of radiation emission is increased while emission by convection is decreased.

The means of heating the panel is immaterial as far as results are concerned. Water, steam, air and electricity have all been used successfully in floors, walls and ceilings.

THE work we have done is based on the use of warm air in ceiling panels. We have used air, not because we were biased, but because others were investigating water; because we believed a less expensive means might be developed so that the advantages of panel heating could be incorporated in the low cost home, because air presented no problem when a house is closed during a winter vacation, because air would not freeze or leak and, finally, because we felt air lent itself more readily to a combination with radiant cooling. Being manufacturers of steam and water boilers as well as warm air furnaces, we have no axe to grind and offer our experimental and field experience only as a contribution and not as a preference.

One installation for a guinea pig house owner about 1938 worked so splendidly that an eight-room test house was erected in which 175 thermocouples were installed to read floor, wall, ceiling and ambient temperatures. Since then hundreds of installations have been made using coal, oil, and gas as fuel in one- and two-story structures with and without basements.

In all of this work only the ceiling has been used as the heating panel for five reasons as listed below:

First: The space that may be made available within or under a floor is rather limited resulting in a high friction loss and a rather exorbitant electrical cost for air circulation.

Second: A floor temperature cannot exceed 85° F without causing discomfort to the feet. A ceiling panel can be heated to 115° F without the occupant becoming conscious of the source of heat. Therefore, a ceiling panel can introduce at least 50% more heat per unit of surface than a floor panel. Many times a ceiling panel is adequate to satisfy the heat loss of a room where a floor panel is not.

Third: When the source of heat in a room is low, as in a floor, more convection currents are established than when the heat source is high. With a ceiling panel 50% more heat is introduced by radiation than from a floor panel.

Fourth: A ceiling is the only unobstructed surface in a room being unaffected by doors, windows, draperies, pictures, furniture or floor coverings.

Fifth: A floor panel is generally constructed of a concrete slab several inches in thickness which is slow to heat and slow to cool whereas a ceiling panel is generally constructed of a ¾-in. thickness of lath and plaster, the thermal storage capacity of which is so slight it can be internally controlled to follow outdoor temperature changes rapidly with no noticeable lag.

Construction

Various types of construction have been used for warm air ceiling panels, but limitations are imposed by the Board of Fire Underwriters so that even when low temperature air is employed no materials having a fire rating classification above 20 are approved. The air used for heating is in a closed system, none of which is projected into the living quarters of the home. The air is conveyed from the heater to the ceiling panels by conventional duct work, with a warm air supply to the panel of each room but with generally only one return from each story of the building. The old fashioned gravity furnace installation often had only one cold air return back to the furnace so that an objectionable draft was created as all the air on the floor swept to that one point. With panel heat this is not a consideration as the air travel is all above the ceiling. The use of a com-

mon return with individual supplies reduces cost of both labor and material, yet affords a means of regulating heat in each room. The warm air supplies are carried between the studs, between the joists, or in the attic, and when exposed to cold surfaces they are insulated.

Directly under and to the joists a partition of gypsum board is attached and 3¼-in. below this is suspended a metal lath and plaster ceiling. Within this 3¼-in. space the air is circulated, directed by galvanized strips in such a way that the air covers the entire ceiling. Where possible, the baffling is so arranged that the warmest air is conducted over that portion of the ceiling adjacent to the exposed walls.

The maximum air temperature used is 140° F at the discharge of the heater, so that when entering the panels it is of the order of 130° F, and when leaving the panels about 85° F. The quantity of heat introduced in a given room is controlled by the volume of air to its individual panel.

Compared with forced warm air heating, the temperature drop of the air is much less, so that about a 50% greater volume of air must be handled. However, velocities can be higher because the occupants are not affected by air movement, and as there are no registers or openings into the rooms the noise level is not a consideration.

No special plaster has ever been used. Ceilings have been both rough and smooth, painted and papered. Tests of plaster in use over six years have shown no indication of calcining or deterioration. No dust pattern such as may result if improperly spaced hot water piping is used has ever been present.

Controls

The only method of control with these warm air panel systems has been a conventional wall-mounted thermostat which actuates the firing device intermittently, a bonnet thermostat that starts and stops the blower at pre-determined air temperatures and a limit control that stops the burner if the air temperature reaches 140° F. The response of the plaster panel has been so rapid that temperature variations in the living quarters are imperceptible to the occupants. With convection systems the thermostat starts the burner when the air temperature is low and stops the burner as a higher air temperature is reached. In the test house this cycle was reversed, with the air temperature lower by a fraction of a degree when the thermostat called for heat than when it was satisfied. Apparently the thermostat was affected to some extent by radiation from the ceiling faster than the air could be warmed from the wall and floor surfaces.

To check the possible overrun in temperature after a period of prolonged operation, the test house structure and air was cooled to 50° F and the heating system started. It required about three hours to satisfy the thermostat, which is as fast as the research residence at the University of Illinois was heated with gravity warm air—the fastest system known. At the end of this prolonged run the air temperature rose only 2° F above the control setting before starting downward. Floor panel installations have been known to require 48 hours to reach temperature settings and under some conditions have overrun 10° or more due to panel thermal storage and reverse heat flow from the ground.

WHILE the many advantages of panel heating are desirable in any house, the system is particularly adaptable to basementless structures which have not been adequately heated by other systems because the floors and air adjacent thereto have been cold and floor to ceiling temperature gradients have been high. With ceiling panels the floor temperature is generally higher than the air temperature up to the 30-in. level.

In the average two-story house the greatest air movement is generally down the stair-well, and this is often aggravated by an underheated second floor. Measurements at various points in the stair wells of two two-story houses heated with ceiling panels showed an air movement less than 50 fpm, which is considered still air.

While most installations of warm air panel heating so far have used direct fired heaters, two building plans are now being developed which will use hot water through exchangers. One of these is a central school, in which it is planned to use panel heating for all class rooms and as an experiment to reduce the tempered fresh air to 50% of current legal requirements.

In addition to the greater degree of comfort, cleanliness and invisibility are probably the two most desirable advantages of panel heating. All of the basic fundamentals are not yet definitely established, but observation indicates even a greater degree of comfort is possible adjacent to large surfaces of glass than with other systems. This is probably due to the fact that while glass is transparent to the infra-red ray from a high temperature source, it is opaque to the ray from the low temperature source and therefore most of the rays striking it are reflected.

Prize Winning Cover

This cover, which appeared on the "News Meter," published by San Diego (Calif.) Gas & Electric Co., won first prize in the 1947 Red Cross Fund Campaign cover contest for company publications. Pictured are rescue workers from a Red Cross Disaster Unit at the scene of an airplane crash near San Diego. Jack Stevens was the photographer.

UNMETERED SERVICE

Methods used in estimating consumption and converting services under emergency ruling passed by California commission to solve meter shortage problem.

By JOHN A. READE
Utilization Technician
So. Counties Gas Co., Los Angeles

UNMETERED service, an emergency measure only recently authorized by the California Utilities Commission to combat conditions arising from meter shortages, introduces some factors heretofore not encountered that are currently of widespread interest. These factors, together with the present policies of the Southern Counties Gas Co. governing them, are presented herewith.

The California Utilities Commission rules, as filed by this company, include the following provisions:

A. Meters may be removed where:

1. **For three consecutive months the usage has not exceeded minimum charge provisions of its general service schedules.**
2. **Usage, according to the company's records, is known to be either uniformerly constant as to use per month, or as to use per unit of product manufactured or processed by consumer, and may thus be estimated within reasonable range of accuracy.**

B. The company may, with consent of the consumer, establish unmetered service at new installations, and may estimate the consumption at such installations from the best available data.

In instances where meters are removed under the minimum charge provision, the consumer is billed the monthly minimum charge under the applicable rate schedule and the estimated gas consumed entered on the meter sheet. This estimated usage is determined from previous meter readings. In instances where meters are removed under the uniform usage provision, the consumer is required to provide such data as is necessary for the purpose of estimating monthly usage.

To establish unmetered service at a new installation, it is necessary to obtain the consent of the consumer to accept unmetered service and the estimated consumption as determined by the available data. Although this estimated consumption is not subject to negotiation, but is final and determined only by the utility, this requirement is being augmented by this company by obtaining the consumer's signature on a special agreement form. This insures complete understanding by the consumer as to the means of estimating consumption, and prevents future difficulties arising from possible dissatisfaction.

In order to estimate consumption for a given installation with reasonable accuracy, it is necessary to have available the results of a previously conducted survey in the territory involved in unmetered service. This survey must cover a sufficient number of installations to insure representative consumption values for each of the various gas appliances in use. Table 1 shows the results of such a survey covering more than 40,000 installations. As will be noted, this table lists monthly consumption of the various appliances in cubic feet, with the exception of heating equipment. In order to reduce heating equipment requirements to a standard workable basis, it was necessary to introduce a constant, and this constant is multiplied by the Btu input rating of the heating equipment to obtain the monthly consumption in cubic feet for a given installation. As an example, take a central heating plant rated at 50,000 Btu input. To determine the estimated consumption for the month of December, multiply the constant $117 \times 50 = 5.9$ Mcf.

Although the values arrived at by this method cannot be said to be absolutely accurate for any given installation, due to the variations in family, size, standard of living, etc., they are sufficiently accurate for the great majority of installations. In some cases, under unusual circumstances—such as where a single individual, who is away all day, occupies the premises—it may be necessary to deviate from the established consumption table to allow for these conditions.

Test for Leaks

In converting an existing consumer to unmetered service, it is first necessary to insure no leakage exists in the houseline. To accomplish this, the meter should first be tested for registration. After it has been determined the meter is registering properly, the appliances are shut off and a regulation meter spot made. If this meter spot shows no registration or leakage sufficiently small, as outlined in the company's policies, the meter and swivels are removed and the necessary pipe, including a union, is installed replacing the meter.

In initiating the service to a new consumer, it is desirable to build the meter set as nearly standard as the supply of pipe fittings will permit. Where pipe fittings are in short supply, the inlet side of the meter set, up to and including the regulator, should be built to standards, and the houseline located so it will not have to be relocated at the time a meter is installed. The serviceman, before connecting the houseline, installs a test meter (5 lt. or equivalent size) between the regulator outlet and the houseline, using flexible hose connections. These flexible hose connections consist of a short length of rubber tubing terminating at one end in a punched rubber plug, which will wedge tightly into ¾-in. fittings, and at the other end in

MR. READE returned from four years of military service in 1945 to resume a career with the Southern Counties Gas Co., Los Angeles, that began in 1935. His duties now embrace, among other phases, planning the service practices, reviewing of codes and ordinances dealing with gas piping and appliances, and contacting manufacturers regarding gas appliance problems. He holds the title of utilization technician.

During the war years, Mr. Reade served with the army air forces in the maintenance division, Ninth Air Force Service Command Headquarters, attaining the rank of major.

This paper was presented at the Utilization Conference of the Technical Section, Pacific Coast Gas Association, Feb. 26-27.

UNMETERED SERVICE

a standard meter swivel. A regulation meter spot is then made and the standard procedure followed. The test meter is then removed and the necessary pipe, including a union, is installed, replacing the meter.

In order that servicemen may be able to handle high bill or leak complaints from consumers on unmetered service, it is necessary that they be equipped with these flexible hose connections and a test meter. To check for a leak in a houseline or appliance, it is necessary to remove the short connection between the regulator and the houseline and install the test meter as previously outlined. The standard procedures are then followed.

"Turn-on" and "turn-off" procedures remain standard with the exception of the necessity of installing a test meter during "turn-ons" for the required leak test. "Turn-offs" are accomplished by removing the connection between the regulator outlet and houseline, and terminating these with iron plugs or caps. This method is preferred to rubber safety plugs in order that the meter reader may check unmetered accounts for illegal connection and use of gas by consumer.

TABLE 1. STATEMENT SHOWING CONSUMPTION OF VARIOUS APPLIANCES, TO BE USED IN ESTIMATING MONTHLY BILLS FOR UNMETERED RESIDENTIAL SERVICE

Month	Range Only	Range (In Combination)	Automatic Water Heater	Refrigerator	Space Heating *
January	3,400	1,600	2,900	700	*161
February	2,900	1,400	2,600	700	131
March	2,800	1,500	2,600	700	110
April	2,600	1,500	2,500	700	87
May	2,200	1,400	2,200	800	57
June	1,600	1,100	2,000	800	36
July	1,700	1,200	1,800	900	28
August	1,200	1,000	1,800	1,000	—
September	1,200	1,000	1,700	1,000	—
October	1,600	1,100	2,000	900	32
November	2,300	1,400	2,300	800	70
December	3,100	1,700	2,800	700	117
TOTAL	25,600	15,900	27,200	9,700	*829

* Cubic feet of gas per "M" Btu of input capacity of heating appliances. For arriving at the total Mcf of gas used for this purpose, the figures in this column are to be multiplied by the "M" Btu rating of the appliances—e.g., 117 (Dec.) x 50 "M" Btu rating=5.9 Mcf.

INDIANAPOLIS INSTALLS TWO WATER GAS SETS

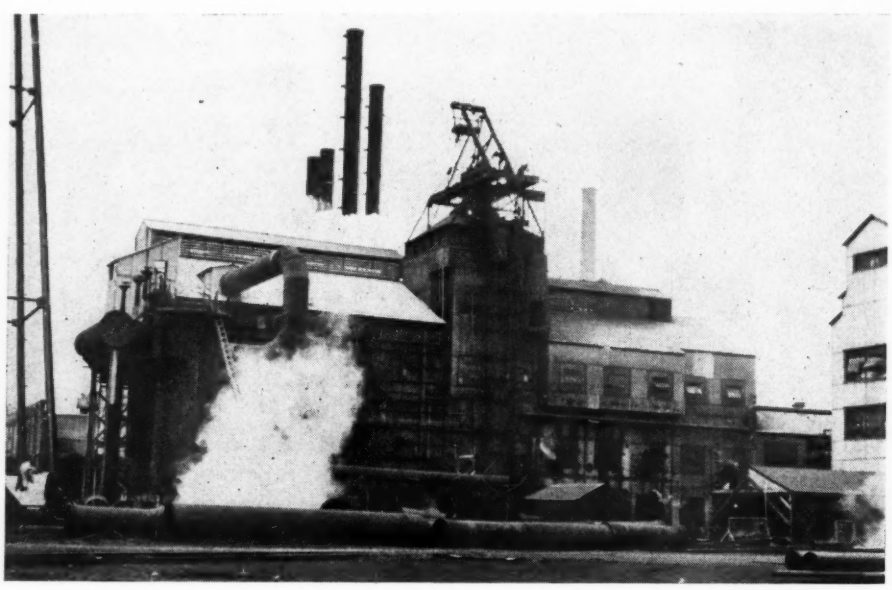
PEAK loads during the winter months which have pyramided to as much as 43 MMcf, necessitating temporary shutdowns of industrial gas supplies, have moved Citizen's Gas & Coke Utility, Indianapolis, Ind., to install two new water gas sets to prevent such situations in the future.

The new water gas equipment was rushed to completion in early 1947, and was only one day away from operation when the last cold snap forced a closing down of industrial gas distribution.

The contract for the two water gas sets was let in February, 1946, and one unit was finished in January, 1947. Together they will produce 15 MMcf of water gas per day. Fed by egg coke, about 165,000 lb. each 24 hours, the two water gas sets can produce about 335,000 cfh., equal to the production of three older sets at the Prospect plant. Here the company has three other water gas units, as well as two old sets at the Langsdale plant. Extra facilities will supplement with oven gas about nine months of the year.

The water gas plant capacity has thus been increased 15 MMcf per day. In addition to the two U.G.I. water gas sets, there is a new gas purification plant capable of handling a 30 MMcf per day load at capacity.

Equipment consists of two 9-ft. ID U.G.I. Model "D" mechanical generators, two 12-ft. carburettors, superheaters and wash boxes—fully automatic—with air supplied by Roots Connersville blowers, each capable of supplying 38,400 cfm at 72-in. W.G. Gas leaving the water gas plant passes through three new pass condensers, 8 ft. in diameter by 30 ft. high, into a relief holder. From this point it is pumped through a new 30-MMcf per day purification plant consisting of two Cottrell tar extractors, two napthalene scrubbers, a liquid purification scrubber, and a four-box oxide purifier. The piping for this plant is so arranged that the equipment can be run in parallel when operating at 30 MMcf per day or individually when operating at 15 MMcf per day.



Completed water gas building. New addition at left of elevator shaft.

Gas Uses In Textile Processing

"The industry is crying for help"

By E. V. K. SCHUTT

Industrial Gas Representative
Central Hudson Gas & Electric
Corp., Newburgh, N. Y.

THE textile industry, one of the largest in our country, is crying for help. They make your clothes, bed sheets, blankets, tablecloths, draperies, and thousands of other articles that require specific processing of fabrics to be made useable.

A leading textile man states that the problem was, is, and always will be that of drying. It is evident that the present method of drying, which is one of the most important parts of processing, is unsatisfactory. There must be a better way.

A solution that will assure us of better ways must be seasoned with the experience and knowledge of past history. The need for improvement in textile processing does not imply that the industrial gas engineer and equipment manufacturer have not done a fine job in the past.

This cry for help from the textile industry is directed toward two needs: faster production and better processing. Unlike most businesses, the textile industry is a prospect for almost every equipment manufacturer. Drying ovens, high pressure boilers, air heaters, immersion atmospheric and pressure burners, radiant heat, automatic heat control and safety devices are urgently needed. What an opportunity for equipment manufacturers and what a challenge to the gas industry to continue the trend to gas!

If a solution for better ways today should be seasoned with the experience of knowledge of the past, it will be interesting and well to know a little of the history of textiles.

Textile is the general name applied to the products of the weaver. History records silk fabrics in China as early as 3000 B. C. In 1500 B. C. the Israelites knew the art of weaving, for the Bible in Leviticus speaks of the warp and woof of woolen and linen garments, their defilement from leprosy, and the necessity of their being burned by the priest.

Wool flax and cotton were all known by the Egyptians and the process of dyeing was well established. It is doubtful if our machine-made fabrics and our dyeing process will match their art. Their formula for making dyes is unknown, but we are sure that the radiant heat from the sun did their bleaching and drying. It was only a little over 100 years ago that textile fibers assumed industrial and commercial importance. Cotton and wool began to lead in large amounts over flax. Next came vegetable, animal, and mineral fibers with problems of dyeing and finishing.

The radical change in textile processing came shortly after World War I, when synthetic fibers developed rapidly, and posed problems which are still with us. The processing of these artificial fabrics such as rayon and acetate rayons requires more exact control of temperature than does that of flax, wool and silk, and, in addition, increased production is now a must.

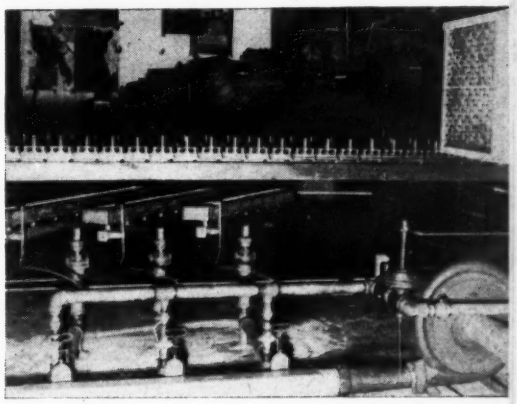
NEW DRY BOXES

Perhaps the greatest need in textile processing today is to find some way to dry acetate rayons such as crepe, dress goods, and similar fabrics. They are ruined in high temperatures, and require controlled heat for satisfactory processing. Such cloth must be processed in ovens (not on frames) in temperatures not to exceed 250° F.

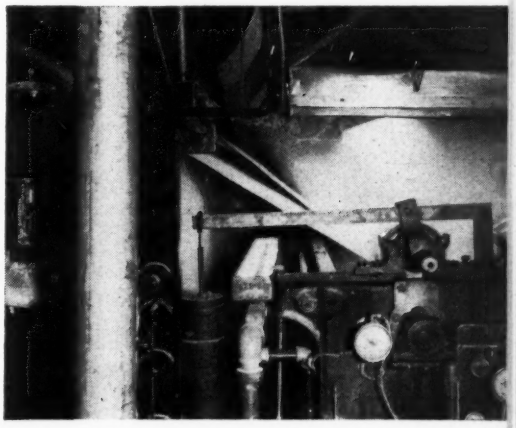
The same oven should be capable of curing dry fabrics that must be subject to 350° F. for possibly three minutes.

There is not a textile plant in our country processing acetate rayon that has ovens capable of meeting these requirements satisfactorily.

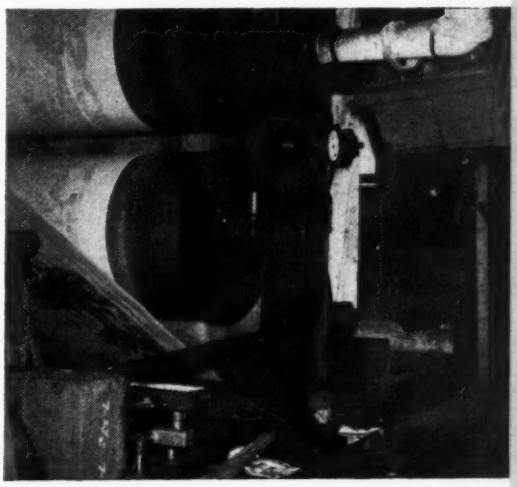
For a generation or more several reputable dry box manufacturers have



Gas burners shown under tenter frame. Box at right is air filter.



Gas-fired infra-red burner speeds slasher production 18-20%.



Gas burner at first steam heated cylinder speeds drying.

Presented at AGA Industrial and Commercial Gas Sales Conference, Boston, Mar. 17-19.

supplied the textile industry with steam heated boxes. They are specialists and know their business. This year thousands of dollars are being spent for new steam heated boxes that will sell for from $20,000 to $50,000 each. These manufacturers know that their equipment should meet the requirements, but they give no guarantee, for they cannot supply higher controlled temperatures than existing steam pressures available will permit.

Gas engineers know that with proper research an oven or box can be built to meet textile wants. We should suggest properly applied radiant heat installations for they would be extremely economical of valuable floor space.

We must prove to the textile industry that we have a solution for their needs, which is: proper application of radiant heat with guaranteed temperature control. *If we add to these features a postive proof that there will be no fire hazard by using gas, a new field will be opened for gas.*

OLD DRY BOXES MADE NEW

Many gas burner installations are located just ahead of the entrance to various forms of enclosed dryers. Speed increases of 20% to 50% are frequently obtained. The burners not only remove moisture from the material at that point, but also serve to preheat the material so that it is delivered to the oven or dryer at higher temperatures. This permits the entire travel through the oven to be utilized for drying, where previously a considerable portion of this travel was used in bringing the goods up to the evaporating temperature. There is always a very limited space ahead of a dryer to accommodate this operation, so it is necessary to transfer heat to the material and the water it contains in the most rapid manner possible. From actual operating tests we find the modern infra-red gas burner will transfer more heat to cloth in less time and space than will any other method in practical use. *The prospect for selling gas for this phase of processing is tremendous; there is no competition, and if the burner is properly applied the old dryer will perform better than when it was new.*

TENTER FRAME DRYING

In practically every textile plant there are tenter frames of varying lengths—30 to 90 ft.—used for drying fabrics having flat finishes, such as taffetas, nylons, many varieties of coat and suit linings and countless delicate synthetic silk materials such as celanese, ninon, rayon sharkskin, etc. These materials contain 30 to 100 lbs. of moisture per 100 yd. and the drying period to complete the evaporation is dependent upon frame length or time of travel. The first method of drying this material was by radiant heat. Material was stretched on stationary frames for drying and radiant heat was applied to the fabric by moving carts laden with red hot coals back and forth under the material. Demands for greater speed in production and better processing led to a reversing of the process, namely, moving the frames and having the heat source stationary. Steam coils have been and still are the accepted source of heat for drying; so, of course, steam coils were located under the cloth on tenter frames in an attempt to dry the goods as it passed through the frame. This very slow heat transfer led to the adoption of various types of gas burners.

First, the drilled pipe burner, next the ribbon burners and later, various types of pressure burners, were installed. Different combinations of blowers were also used, but it was found that large volumes of air forced against the material in its wet stage had a tendency to "belly" the goods, counteracting the tentering or stretching effect of the frame. The next step was to return to steam coils, using an enclosed insulated housing. This type of equipment with circulating fans and air ducts proved quite satisfactory, but we found that a simple installation of several radiant burners frequently doubles the drying speed. If it is always necessary to add radiant heat to speed up textile processing, it is obvious that we can save the textile industry huge investments in expensive housings by first evaporating moisture with infra-red heat. These synthetic resin finishes will not be injured if the material is wet when this direct fired heat is applied.

For a solution to a need, may we quote part of a letter to the American Gas Association, Jan. 2, 1947, from the Colonial Piece Dye Works, North Bergen, N. J.

> After the installation of two infra-red burners, we were able to inrease our drying speed on light quality acetate, rayons, and rayon acetate mixtures by 100%. We are now also able to process heavy quality goods which we were unable to dry with old type of equipment. We now run a four fibre suiting fabric consisting of aralac, cotton, wool and rayon. One advantage which we feel to be well worth mentioning is the increase in life of our Palmer blankets. These blankets cost $550 each. Prior to the installation of infra-red equipment it was necessary to install a new blanket on an average of once every six weeks. We now find it necessary to change blankets only twice a year. This feature alone has repaid the cost of the equipment and gas used many times over.

It would pay to install infra-red gas burners on every drying frame.

SINGEING CLOTH

Some fabrics require singeing to give them a smooth surface before they can be finished. Years ago a rather crude method was used which consisted of burning coal under a sheet of metal. The material was moved rapidly against this almost red hot surface and a fairly good singe was obtained. But uniform heats were impossible to maintain. Electric current was applied to a similar idea, but the required speeds in production were impossible to achieve. Open flame gas burners were then applied which was some improvement, but still too slow. Next developed was a compressed flame singer, and it was accepted by the textile industry as a method of producing a perfect singe, but after a few years we were told that it also failed to produce the desired results.

With this thought in mind, the Dutchess Bleachery Co. in Wappingers Falls, N. Y., experimented with infra-red burners for singeing and in a short time noted a startling improvement—a uniform and better singe that could meet the old finishers' specification that cloth be singed as "clean as a hound's tooth." The old method of singeing sometimes required three or more runs through the machine before satisfactory results were obtained. Now one run is sufficient at most any desired speed.

There is no competition for gas if you will specify radiant heat for singeing.

BETTER SLASHER PRODUCTION

Slashers are steam heated cylinders used to dry warp yarn. They are generally considered the bottleneck in production, for they must move slowly in order to dry the sizing on the warp. Generally there is no temperature control and the sizing is baked. This, of course, shows up in the finished cloth. By adding one infra-red burner underneath the yarn just before it passes over the steam cylinder, 18% to 20% increase in slasher production has been recorded, and a much finer product has resulted.

Every slasher is a prospect for an open flame gas drying unit. The modern infra-red gas burner has no competition for it can transfer more heat to cloth in less time and space than any other method in practical use.

STEAM CYLINDERS

Steam cylinders are generally used for drying certain types of materials—

Table 1. Fuel Cost Comparison In Textile Processing

Source of heat	Rate per Mcf of gas	Cost per 100,000 Btu	Cost per 1000 lb. of water evaporated at 50% efficiency
Mfgd. Gas (approx. 535 Btu per cu. ft.)	.40	.075	1.65
	.50	.093	2.05
	.60	.113	2.45
	.70	.131	2.86
	.80	.149	3.29
Natural Gas (approx. 1050 Btu per cu. ft.)	.15	.014	.313
	.20	.019	.418
	.30	.028	.61
	.50	.048	1.04
	.75	.071	1.37
	1.00	.095	2.10
	Rate per KW	Cost per 100,000 Btu	
Electricity (3414 Btu per KW)	.01	.293	6.43
	.015	.439	9.65

The above figures are based on gross heat. No allowance is made for efficiency of lamps or burners.

particularly cotton for sheets, tablecloths and print goods. It has been found that the addition of a limited number of burners will greatly increase the drying capacity of a battery of cylinders and help to improve quality. Actually, the various textile drying jobs involve the boiling off of large quantities of water, so by the installation of infra-red burners under the material as it contacts the first cylinder, the drying speed is sure to be increased considerably.

In order to achieve high drying speeds which modern production methods require, properly applied radiant heat is the solution. Evaporation of at least 2 lbs. of water per hour per 1-in. of burner is assured.

STRETCHING, SETTING FABRICS

It is very often desirable to stretch dry fabrics 4 to 8 in. in width. This is done on a frame. First, steam is applied underneath the material, then in this wet condition the goods are stretched to the required width. An instant application of intense heat is then made and the material is set and dried immediately. The only means by which this can be done successfully is by the application of infra-red burners. Past experience in using steam for setting this material was unsuccessful, because the material was not completely dried and lost its stretch. *The solution for this problem, therefore, is radiant heat.*

OTHER APPLICATIONS

So far, the impression must be that to sell gas for textile processing it must be in the form of radiant heat. That is true for the processes already mentioned, but one must not overlook the wonderful job that one burner manufacturer has done in stepping up temperatures in dry boxes nor the present development of burner equipment for curing. There are several recent installations of other gas equipment that we have been informed have made quite a contribution in this respect. Many high pressure gas steam boilers are helping to process textile fabrics, and we all know the important part air heaters play in raising temperatures in ovens where the heat source must be indirect for safety operation. The final solution is proper application.

COMPETITION

Steam versus Gas—The roots of the present lie deep in the past. Steam has been the accepted source of heat for textile processing for generations, and people simply conclude without investigation that gas is a very expensive source of heat for industrial purposes. They never consider that the greater efficiency of gas heat generating equipment to a large extent offsets higher fuel costs, and that the use of gas increases the profit possibilities.

It is not sound reasoning to say, without investigation, that steam is cheap. Every pound of steam requires energy and consumption of fuel. Steam costs seem to be pretty much a matter of accounting. Actual figures for consumption of steam indicate that most drying operations require around 3 lb. of steam to evaporate 1 lb. of water. Sixty cents per thousand pounds seems to be an average cost for steam, so it would cost $1.80 to evaporate 1000 lb. of water from textiles under average conditions. As a comparison, manufactured gas with 535 Btu per cu. ft. at 50 cents per thousand would cost $2.05 to evaporate one thousands pounds of water. (Gas costs computed at 50% efficiency—see *Table 1*).

Would not substantial increased speeds in production and improved processing greatly offset this 25 cent difference in fuel costs?

Electricity versus Gas—Considerable amount of misinformation is given out regarding the use of electric infra-red lamps for drying. One kilowatt is equivalent to 3414 Btu whether used in a toaster, an infra-red lamp, or in some other form of electric equipment. Using an efficiency of 50% for comparison, it would cost $6.43 at a rate of one cent per kilowatt to evaporate 1000 lb. of water compared with $2.05 gas at 50 cents per Mcf.

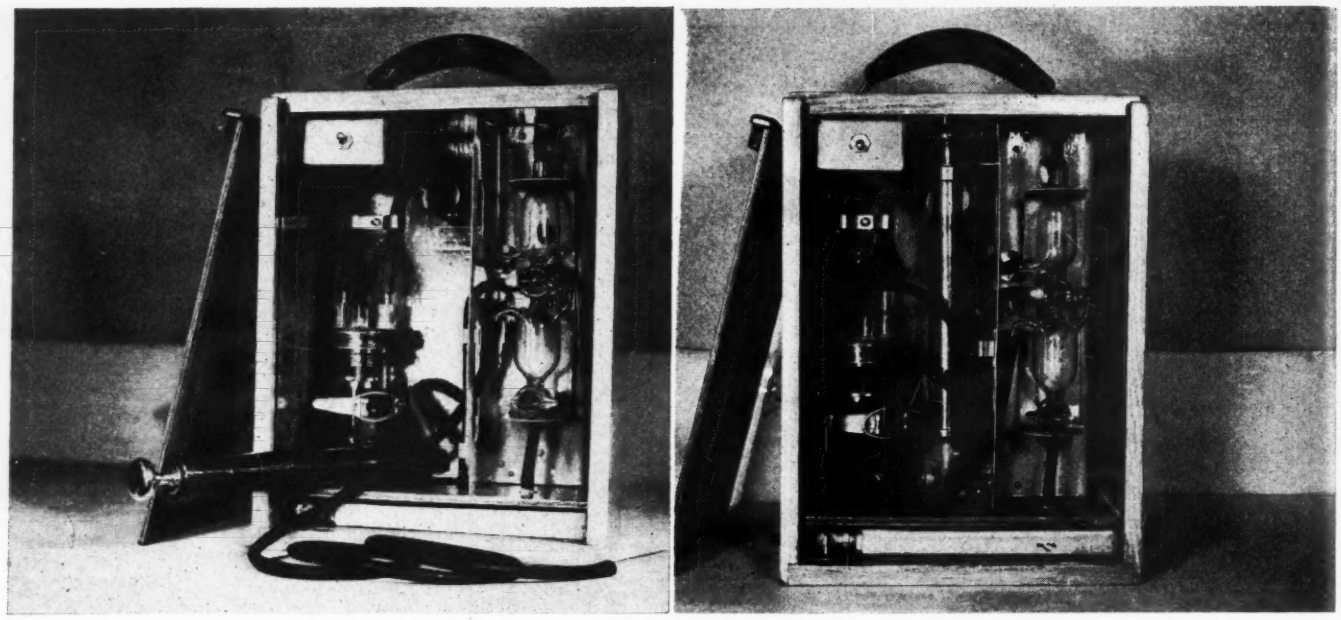
There is no competition at all with electricity when the question of evaporating moisture or preheating materials is considered. Available space for applying heat will not permit enough lamps to be installed to generate sufficient heat to make a noticeable impression.

For example, one infra-red gas burner 63 in. long and 5 in. wide will emit 337,000 Btu at normal ratings and requires little more space than the burner itself occupies. This is equivalent to 98 KW, or 392 lamps of 250-watt capacity, which require more installation space than could be satisfactorily provided. This same idea applies to oven heating.

Without investigation, some critics have said that direct-fired infra-red gas burners will harm the fibers of materials such as wool. This is not true. A recent installation of infra-red gas burners was made in a Passaic, N. J., woolen mill. The operation was checked by two independent laboratories, and both report that classes of goods manufactured in the plant from the lightest to the heaviest were successfully run over this equipment. Even the lightest pastel shades were not affected adversely, and the carbonization improved with approximately one-third increase in production.

The only competition we have from electricity stems from the erroneous but popular conception that with electricity the operation is better.

It is a fact that the textile industry wants better ways to process. We have been told that the problem of drying is still not solved, but we now have sufficient proof that properly applied gas burning equipment is the solution.



Two views of Portable Carbon Dioxide Indicator; at left, pump removed, and at right, in place.

COMBUSTION PRODUCTS LEAKAGE

Methods of Checking Furnace Heating Elements

By G. J. SANDUSKY

Utilization Engineer, Southern California Gas Co., Los Angeles

METHODS used in checking for leakage of combustion products from heating elements of gas warm air furnaces by public utilities and furnace servicing agencies vary considerably. For purposes of enumerating and describing these various methods they are divided into two general classifications: i. e., direct methods and indirect methods. Direct methods involve two categories: visual inspection and pressure testing. Indirect methods involve three categories: tests which are dependent upon the visual sense, tests that are dependent upon the olfactory sense, and tests made using instruments.

Exclusive

Information has been drawn rather freely from an Appliance Servicing Committee report in the A.G.A. Proceedings of 1940 for the accompanying table and discussion of methods. The data in this report were compiled from information received from 14 companies ranging from 37,000 to 1.1 million meters each. This report also includes a survey of the conditions under which furnace tests are made.

The Southern California Gas Co. uses the portable carbon dioxide indicator for the greater part of its furnace testing. Smoke candles are used occasionally in conjunction with the indicator tests when it is necessary to determine the extent of flue products spillage from the down-draft diverters.

The strontium hydroxide apparatus in use by Southern California Gas was developed in 1938 by the gas appliance laboratory it operates jointly with the Southern Counties Gas Co. The original instrument was described in the PCGA Proceedings of 1939. A schematic drawing of the original instrument built is shown in Fig. 1.

The following is a quotation from Mr. J. G. Williamson's paper in the 1939 PCGA proceedings:

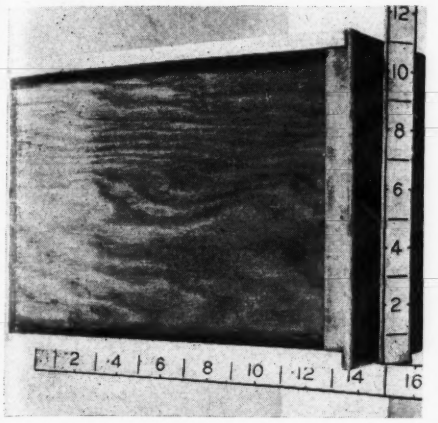
> "The principle of the operation of the instrument is that of the reaction of carbon dioxide with strontium hydroxide. By means of an ordinary bicycle pump, the atmosphere to be sampled is drawn through a measured volume of strontium hydroxide solution containing phenolphthalein as an indicator which gives the solution a reddish color. The gas sample is pulled through the test solution until the latter becomes colorless, at which time the end point is reached. The number of pump strokes necessary to displace this color is noted. A definite amount of carbon dioxide is necessary to neutralize a given volume of test solution; therefore, in an atmosphere of high carbon dioxide concentration just a few pump strokes are necessary to introduce this quantity of carbon dioxide, whereas in an atmosphere of lower concentration a greater number of pump strokes are required. Consequently, the concentration of carbon dioxide in the sample is inversely proportional to the number of pump strokes."

Since the first models of this instrument were made, considerable design work has been performed and two or three interim models with various improvements were constructed. These changes have culminated in the present

FOR THE past 12 years an employee of the Southern California Gas Co., Mr. Sandusky has directed his efforts toward the bettering of customer service. As a utilization engineer for the past half-dozen years, he has been in charge of domestic gas utilization engineering, industrial service, gas engine service, air conditioning service, and large volume measurement.

He holds a degree of Bachelor of Engineering in electrical engineering from the University of Southern California, Los Angeles.

The first portions of this paper were presented at the Pacific Coast Gas Association's Technical Section Utilization Conference, held at Sacramento, Calif., in April, 1946. Further work on the project has yielded additional information which is presented exclusively herewith.



Portability of Indicator case is demonstrated by tape measure readings.

instrument. A schematic drawing of the later model is shown in Fig. 2.

Preparation of strontium hydroxide solution:

1. To 100 milliliters of distilled water add approximately 1½ grams of strontium hydroxide and approximately ½ gram of thymolphthalein. Let this solution stand until saturated (approximately 24 hours).
2. Decant liquid into a dropping bottle and keep tightly stoppered when not in use.

Preparation of solution for field use:

1. To one pint of distilled water add 30 drops of the strontium hydroxide - thymolphthalein solution. Stir the solution as the drops are added with a clean glass rod.
2. Pass a sample of atmosphere air through the apparatus, using this solution and determine the number of pump strokes necessary to reach the end point.
3. If less than 50 strokes are required, add one drop of the strontium hydroxide solution for every two strokes less than 50.

Using The Apparatus

The solution used in the apparatus should be prepared the same day that the apparatus is to be used. Care should be taken in transporting the apparatus between jobs, so that the solution will not be unduly shaken.

In making a test in the field, the operator should first determine the number of pump strokes required to give an end-point with normal atmospheric air (0.03-0.04% CO_2). Then a determination of air in the furnace room should be made. If less strokes are required to reach an end-point with furnace room air than with atmospheric air, check the down-draft diverters of appliances in the furnace

TABLE I. METHODS USED IN CHECKING

Direct Methods

(a) METHODS INVOLVING VISUAL INSPECTION

1. Unaided visual inspection
This method obviously is the most widely used, although it is frequently supplemented by more exact tests. This method requires no instruments or tools other than, perhaps, a flashlight and a mirror. This method used alone is good only for indicating relatively large leaks.

2. Placing an intense electric light force within the furnace element.
This method is used in two ways. In some instances a duct or ducts are removed from the top of the furnace bonnet and the outside of the element inspected while it is still in the furnace. In other instances the element is removed and placed in a dark room, and with the furnace openings plugged, any cracks or holes are easily detected.

(b) METHOD INVOLVING PRESSURE TESTING

1. Subjecting the element to a positive air pressure.
This method consists of closing the regular furnace openings, such as the flue outlet, seondary air openings, and combustion chamber door; and subjecting the furnace to a positive air pressure. A drop in pressure indicates any leakage that may exist.

Indirect Methods

(a) METHODS INVOLVING THE VISUAL SENSE

1. Smoke bombs or candles.
The use of this method usually requires the flue outlet to be closed. The smoke cartridge is ignited in the furnace. The inoffensive smoke is visually indicated in the air ducts or at the register, if leakage exists.

2. Fuming Stannic Chloride or Titanium Tetrachloride.
The furnace is heated and the burner then shut off. The flue outlet is closed. A small amount of titanium tetrachloride or stannic chloride is poured on a small rag previously placed in the air duct or at the registers. Smoke is visually indicated in the duct or at the register if leakage exists.

(b) METHODS INVOLVING THE OLFACTORY SENSE

1. Oil of Wintergreen.
The furnace is started in order to produce circulation. A tube of oil of wintergreen is then broken in the combustion chamber. If leakage exists, odor is indicated at the open registers.

2. Essence of Peppermint.
The furnace is started and allowed to burn for 10 or 15 minutes. The burner is then shut off and the flue outlet blocked. A metal container containing two ounces of essence of peppermint is placed in the furnace at the fire door. The burner is lighted and allowed to burn for about three minutes with the flue outlet blocked. If leakage exists, odor is indicated at the registers.

3. Sulphur or sulphur candles.
The sulphur candle or the sulphur is burned in the combustion chamber. If leakage exists, odor is indicated at the register.

4. Rubber.
The rubber is burned in the combustion chamber. If leakage exists, odor is indicated at the register.

5. Smudge by damp newspaper.
The damp newspaper is burned in the combustion chamber. If leakage exists, odor is indicated at the register.

(C) METHODS INVOLVING INSTRUMENTS

1. Orsat.
Accurate analyses of the air from the registers are made with and without the furnace in operation. A change in the analysis indicates leakage.

2. Volumetric measurement of the flue gases from the flue outlet by means of a pitot tube traverse.
This volume is then compared with the theoretical volume of the products as calculated from the products of the gas input rate.

3. Dew Point.
This method consists essentially of determining the dew point in a room before and during operation of the furnace. A change in dew point indicates leakage of products of combustion.

4. Portable Carbon Dioxide Indicator.
This method involves the use of a portable strontium hydroxide apparatus used to make comparative determinations of low concentrations of carbon dioxide in atmospheric samples. A sample is taken of the air entering the heating chamber of the furnace, and is analysed by means of the indicator. A second sample is then taken of the heated air leaving the register and is analysed. Any increase of carbon dioxide in the sample taken from the register over that taken from the sample entering the air indicates leakage.

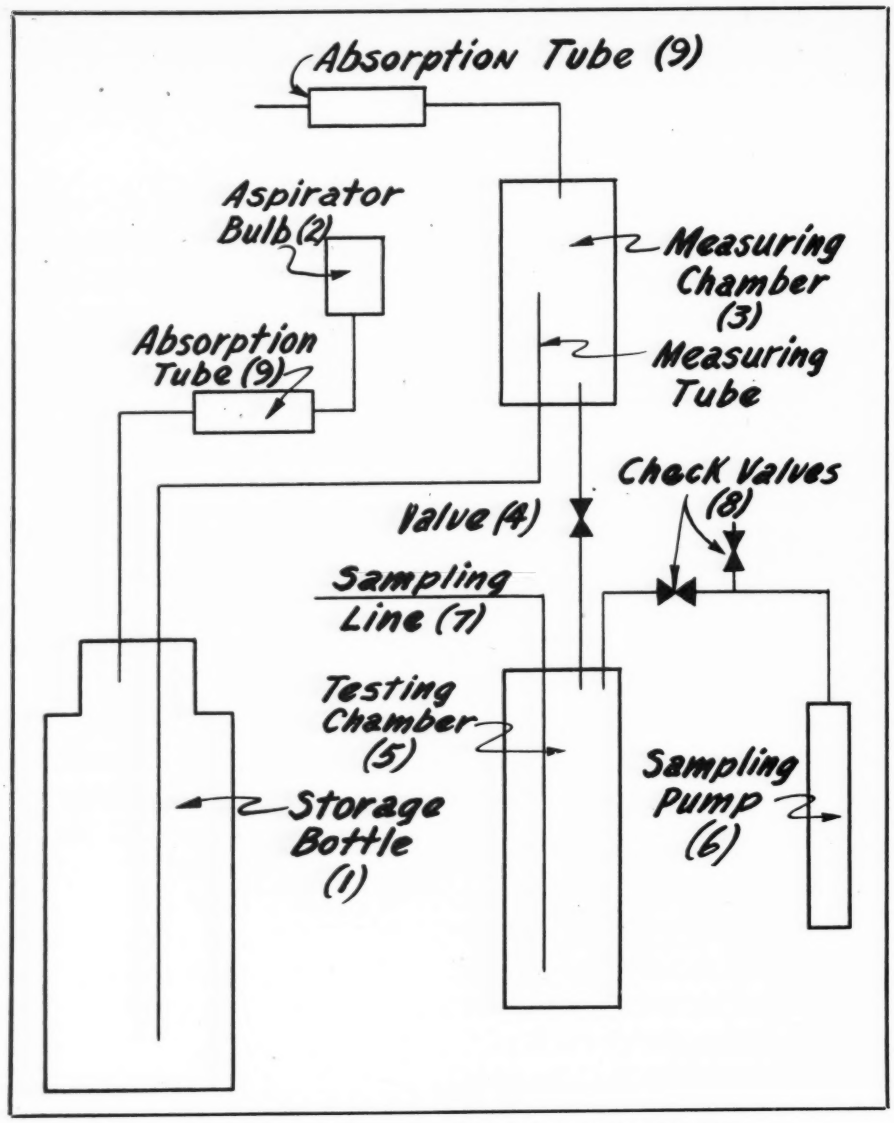


Fig. 1. Schematic Drawing, Portable Carbon Dioxide Indicator.

room for spillage of flue products.

Next determine the number of pump strokes required at the warm air register of the furnace being tested. If considerably fewer strokes of the pump are required to reach an end-point than were required in the furnace room, a leaky firebox and/or heating element is indicated. The number of pump strokes at the warm air register will be somewhat less, even in the absence of flue products, due to the fact that the carbon dioxide in warm air reacts more rapidly with the strontium hydroxide solution.

The difference in the number of pump strokes allowed will probably have to be determined from experience in the field with tests made on furnaces known to have tight fireboxes.

At the end of each day the remaining strontium hydroxide solution should be emptied.

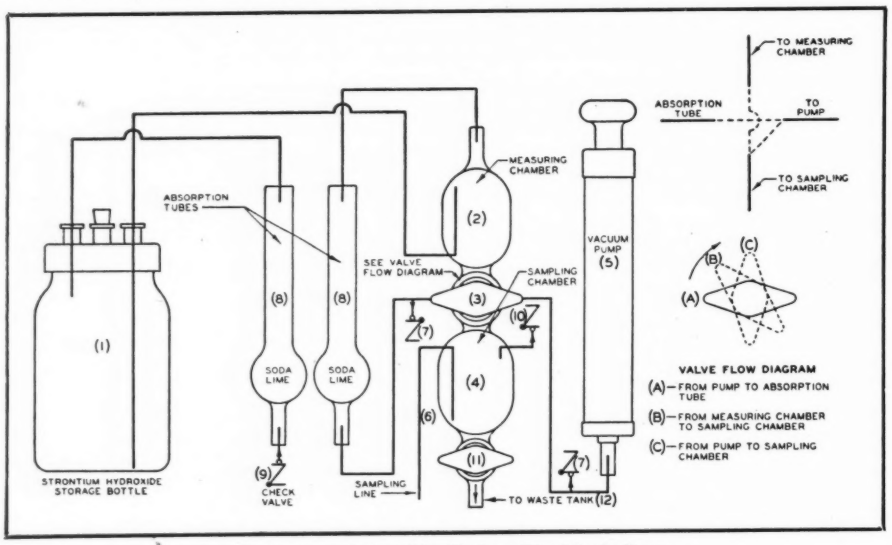


Fig. 2. Improved Portable Carbon Dioxide Indicator.

PORTABLE CO_2 INDICATOR

Constructional features

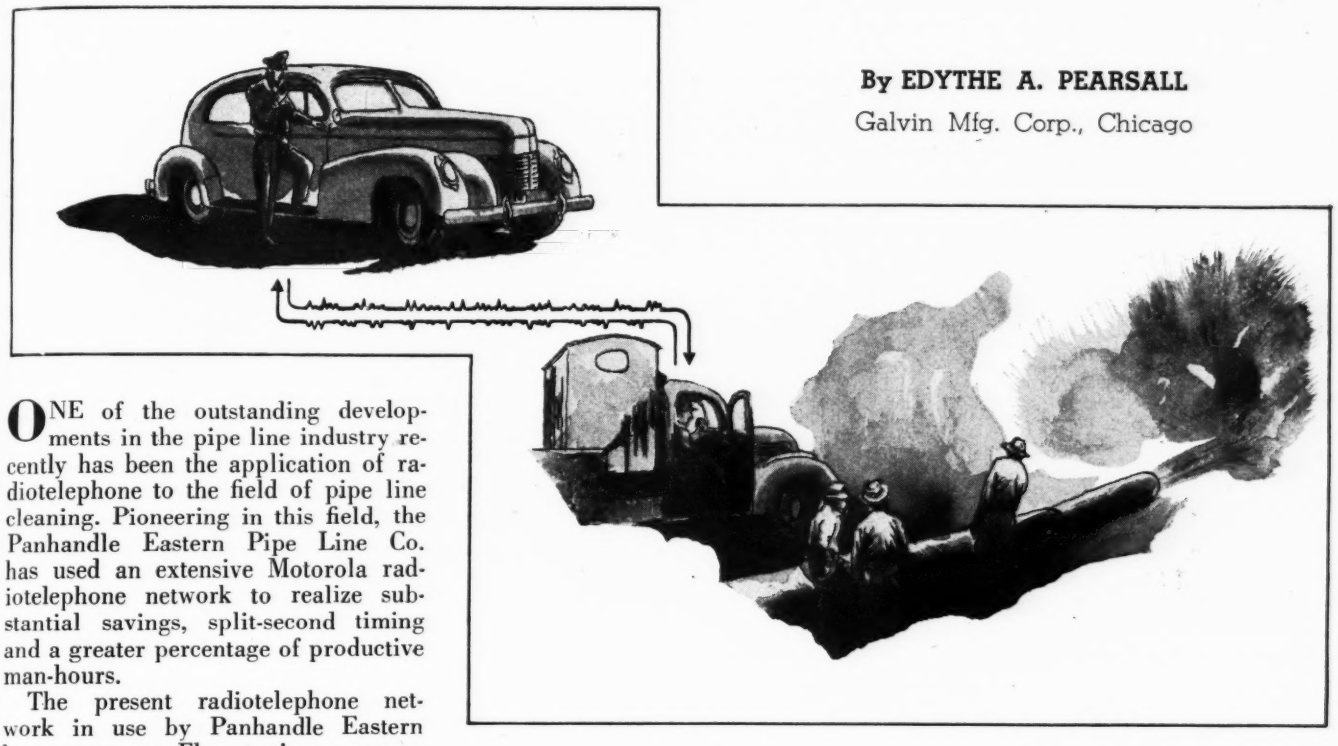
1. A bottle for storing the test solution.
2. A measuring chamber which is designed to deliver a constant volume of test solution.
3. A valve between the measuring chamber and the sampling chamber.
4. The sampling chamber in which the reaction occurs.
5. A vacuum pump for pulling the solution from the storage bottle into the measuring chamber and also for pulling the sample through the sampling chamber.
6. The sampling line.
7. A pair of check valves used with the pump.
8. Two absorption tubes filled with soda lime to prevent any contamination of the test solution by carbon dioxide from room air.
9. A check valve to prevent airs entering the storage bottle when the instrument is not in use.
10. A check valve to allow air to seep out of the sampling chamber when the instrument is not in use.
11. A drain cock to release used solution from the sampling chamber to the waste tank.
12. The waste tank.

Operating procedure

1. Remove pump (5) from holding bracket.
2. Turn valve (3) to horizontal position (A).
3. Operate pump (5) until the liquid in the measuring chamber (2) is slightly above the orifice in the fill line.
4. Turn valve (3) to position (B) which allows the liquid to drain from the measuring chamber (2) to the sampling chamber (4).
5. Turn valve (3) to vertical position (C).
6. Pull the gas sample through the test solution by operating the pump (5) with slow steady strokes. The number of pump strokes necessary to reach the end point should be noted. If more than 50 strokes are required, the concentration of carbon dioxide in the sample can be considered negligible.
7. Turn cock (11) from a horizontal to a vertical position, which allows liquid to drain from sampling chamber (4) to waste tank (12).
8. Turn cock (11) back to a horizontal position.
9. Turn valve (3) counterclockwise back through position (B) to position A).
10. The instrument is now ready for a second sample.

Radio Speeds Pipe Line Cleaning

By EDYTHE A. PEARSALL
Galvin Mfg. Corp., Chicago



ONE of the outstanding developments in the pipe line industry recently has been the application of radiotelephone to the field of pipe line cleaning. Pioneering in this field, the Panhandle Eastern Pipe Line Co. has used an extensive Motorola radiotelephone network to realize substantial savings, split-second timing and a greater percentage of productive man-hours.

The present radiotelephone network in use by Panhandle Eastern has many uses. Flow testing, pressure control, measurement, inspection, emergency communication, production and gathering—these are some of the jobs aided by the new communication. Operating in the 25-44 mc band on frequencies allocated by the Federal Communications Commission, the system makes use of liberalized FCC rulings which allow messages, "In connection with the transmission or distribution by wirelines or fixed pipe lines of electrical power, manufactured or natural gas, water, steam; or, operations in connection with the maintenance of transmission or distribution facilities." (Part 17, Rules Governing Stations in the Utility Radio Service.)

Pipe line cleaning may be said to fall under the heading of "maintenance," and it is thus within the boundary of the FCC ruling. No longer, then, is it necessary for men to be stationed along the line, charged with the responsibility of hand signaling as the scraper passes. Pick-up trucks need no longer deliver messages by hand in order that cleaning operations may be coordinated.

The division superintendent in his radio-equipped car remains with his crew at the gate valve at the upstream end of the line, while a radio-equipped gang truck and its crew are stationed eight miles away at the downstream gate valve. As soon as operations are ready to begin, interconnecting valves are opened and the main valve at the upstream end is closed. The gas flow is immediately diverted from the section being cleaned to the loop line. Over the air comes word from the division superintendent, "Interconnection open, main line gate closed, ready to open the blow off!" When the men downstream have reported the mainline gate closed, the division superintendent gives the order to blow down the section.

As soon as the line is flat, the division superintendent instructs "Remove the joint!" Cuts are made in the line simultaneously so no air can enter the line, while radio transmissions insure that the timing is exact. When both crews have completed their cuts, the division superintendent radios, "Remove the joints and install the blow joint." The pig is inserted in the upstream joint and the joint replaced in the line. When everything is ready at both ends, the by-pass gate valve is partially opened, and as the go-devil starts down the line the exclamation, "There she goes!" alerts all crews.

Passing through the line with successive thuds audible on all radiotelephone receivers, the downstream crew hears the go-devil approach. "Lower the pressure" is the terse exclamation as the 580-lb. plug approaches its destination. "She's out" is the cry as the go-devil shoots into the target with heavy impact.

With the pig safely motionless, the pressure at the upstream gate valve is increased to blow out the line. As soon as the dust and dirt clears, the downstream crew notifies the division superintendent. Immediately the line is prepared for re-loading. The blow-joint is removed and the regular joint inserted into the line. Work begins to replace the backfill, and as soon as safety permits, the downstream crew notifies the division superintendent over the air that the line may be placed back in service.

Panhandle Eastern's entire 1300-mile natural gas pipe line is geared for instant communication with a series of 17 Motorola 250-watt central station transmitter-receivers installed at compressor stations extending from the gas fields in the Texas Panhandle to Detroit. Between these stations are 92 Motorola radiotelephone-equipped mobile units, each with a radio transmitter-receiver installed in the trunk or specially mounted on the cab. The military-type microphone is mounted on the dashboard within easy reach of the driver. This microphone may also be used by a pipeliner standing outside of the cab, since it has a long cord which may be stretched across the window.

Estimated savings for the year 1946 in pipe line cleaning were placed between $25,000 and $30,000. Approximately 25,000 miles of driving were saved on the 570 miles of pipe line cleaned.

The fine art of cake baking is the subject of Mrs. G. Marie Parks' demonstration during one of the classes.

"Kitcheneering" Course For Brides

Oklahoma Natural holds statewide classes in six cities

By MILDRED R. CLARK

Home Service Supervisor
Oklahoma Natural Gas Co.,
Tulsa, Okla.

A STATEWIDE course in "kitcheneering" for brides, held simultaneously in districts throughout Oklahoma, was completed in March by the Oklahoma Natural Gas Co., Tulsa.

The statewide aspect of the plan was deemed necessary in view of the fact that, according to Oklahoma state law, utilities cannot merchandise appliances, and since the course was aimed at promoting dealer sales throughout the entire area served by Oklahoma Natural, a school that would afford equal opportunity and interest for all dealers was advisable. Moreover, advertising could thereby be coordinated on a uniform basis.

Timing of the course depended upon availability of merchandise, since regular demonstrations are not included as a part of the Home Service Department's work.

Dealers Briefed

In conjunction with the announcement to the public, the dealers were contacted and informed that the activity was being carried on in the interest of the promotion of modern gas cookery and the use of the Servel gas refrigerator. Believing that a repetition of the name helps to identify the services offered by a utility company, we chose to call our class a "Kitcheneering Course for Brides." "Kitcheneering With The Home Service Department Of Oklahoma Natural Gas Co." was the heading used on all consumer releases.

The announcement advertising, appearing two weeks before the opening of the series, was in the form of a personal invitation to all who were interested in cooking for two or who were brand new homemakers. In order to determine anticipated attendance, we thought it wise to ask for advance reservations by telephone or letter. The public was prompt to respond. The only limitation on the attendance in each of the classes was the seating capacities available in the auditoriums. In all but one district these requirements were fulfilled well in advance of the opening of the first of the class series.

In addition to the newspaper advertising, we featured it in commercials on our state-wide radio program and on the weekly broadcast day, which is known as "Home Service Day." On the latter program, greater emphasis was placed on the features of the classes. It was interesting to observe that a great many of our responses to the course came from the radio announcement—which was proof, too, of the radio audience which we have built up through the continuous four-year program.

Because of community interest, we also received favorable publicity in all of our local newspapers concerning the activity, and during the class series several feature stories were run concerning those in attendance at the classes.

Direct Mail Campaign

We also made use of direct mail announcements to club groups and to individuals. So great was the response in the advance registration that it was necessary in our two larger districts to offer a third class, despite the fact that we were already scheduling two classes, one an afternoon and one an evening class. In the remainder of our districts, the program was featured as an afternoon activity.

While an effort was made to limit the enrollment to the new homemakers, we did, of course, have some in attendance who were experienced in the culinary arts, but who were so interested in learning what was new and up to date that they continued throughout the class series.

Interestingly enough, there were in the group of enrollees several men who were ex-G.I.'s and who wanted to learn the arts of food preparation and were as regular in their attendance as any of the eager brides. Another interesting fact in connection with attendance of the classes was that in several instances members of the class who were visiting in towns other than where they enrolled were so eager to have a perfect record of attendance that they made a point of attending the class in some one of our other district offices.

We offered no prize in connection with attendance at the classes, announcing only that the recipe sheet information and the book cover would be available to those who were actually in attendance. The cover for the recipe sheets was presented at the final class, and therefore, only those who had maintained perfect attendance received this award.

The foods prepared during the demonstrations were in a few instances presented as prizes—but only if they could easily be carried home by the winner.

Subjects

The six lesson course featured the following subjects: "Fruit and Vegetable Cookery"; "Egg and Cheese Cookery"; "Quick and Yeast Breads"; "Meat, Fish and Poultry"; "Cakes, Pies and Desserts"; and "Piecing the Mealtime Puzzle," the final lesson, which concerned building the menu. Each lesson sheet was set up on a different color paper and appropriate illustrations for the subject at hand were used in dressing up the lesson sheet.

During the demonstrations, the performance features of the range, refrigerator, and modern water heater were all pointed out, and, in the closing lesson, were summarized with points to look for in choosing a modern gas range, gas refrigerator, and a modern, automatic storage water heater.

Modern water heaters are installed on all the platforms in this company, thus making it easier to visualize and dramatize the importance of the selection of this piece of equipment. In addition to the placing of emphasis on appliance selection in the final lesson, a display of modern cooking utensils was arranged in cooperation with local dealers' houseware departments, in order to call to the attention of those in the class the importance of the selection of good equipment.

Classes were frequently informal with those in attendance coming to the platform to make closer observation of cooking techniques. Mirror above the range enabled the entire audience to observe range performance.

700 Enroll

A total of approximately 700 women were enrolled in the class series presented in six of the major cities in our territory.

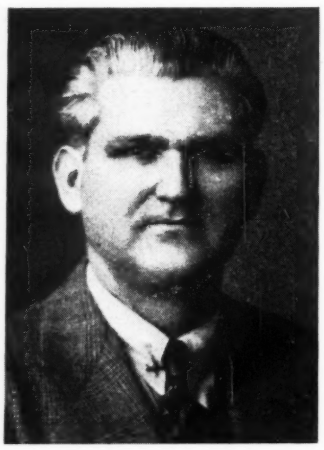
In view of the almost perfect attendance records in all of the classes, it was felt that the effort was entirely worth while, since it was possible to tell effectively the story of the performance of modern gas equipment, displayed and available in dealers' stores.

This is perhaps best verified by the requests which have been received in all these communities for an additional class for which others, unable to attend the first series, have requested reservations.

Miss Mary Ellen Laughlin, Enid, explains proper selection of utensils.

Master Interchangeability Chart

A new chart computed by Mr. Knoy. The chart itself appears on Pages 48 and 49; instructions on the proper use of it appear on Page 50.



By M. FRANK KNOY

Research Engineer,
Republic Heaters Co.

THE subject of mixing and interchanging domestic fuel gases is of absorbing interest to the gas industry of postwar America. Several factors have combined to make this so. The continued discovery of additional natural gas reservoirs in recent years and the building of long distance transmission lines to bring this gas to our centers of population and industry have placed new and greater emphasis on the problem of substituting and interchanging the various gases.

Exclusive

Doubtless, for some years to come, natural gas will be brought in increasing abundance to various parts of the East and Middle West. Its low thermic cost and its other well-known advantages as a fuel make gas ideal for space heating in home, office and factory. It also finds a ready market for commercial and industrial uses.

It is good business and sound economics to load up the long distance transmission lines to as high an annual load factor as possible. In doing this, however, it is probable that more space heating load will be taken on than can be carried by the transmission lines on the peak winter days.

Seasonal underground storage is successfully employed in several areas, and where practicable, is a sound solution to the peak load problem.

In other areas it is necessary to set a definite limit on the space heating business that can be accepted, or to utilize a supplementary gas for peak shaving. If the supplementary gas has a sufficient degree of interchangeability and is of reasonable cost the future holds an era of prosperity for the gas company.

PROCEDURE FOR SUBSTITUTING GASES

In substituting one gas for another, or in adding the supplementary gas to the system, the gas engineer may:

1. Add whatever supplementary gas is available to the system in as great a proportion as can be tolerated for good appliance performance.

If the supplementary gas differs greatly in its characteristics from the base load gas, such as a high gravity carburetted water gas from a high heat value, low gravity natural gas, the quantity of supplementary gas tolerated by the system may be too small to be of material assistance in carrying the space heating load.

2. Modify the supplementary gas in such a way that it can be tolerated in the system in proportions up to 50% or more of the total volume.

Let us assume, for example, that the base load gas is coke oven gas of 550 Btu and a specific gravity of .40, and that the supplementary gas is carburetted water gas of 550 Btu and .64 specific gravity. Turn to the accompanying chart and read the operating instructions printed on the back. Now place a straight edge across the chart from reformed propane, C, to water gas, H. It will be observed that the midpoint of the line CH falls very close to coke oven gas, E, in heat value and gravity.

We know that reformed propane, such as C, consists largely of hydrogen with a little methane.

We know from the chemical analysis that the addition of this gas to carburetted water gas will bring its chemical composition as well as its heat value and specific gravity more nearly into line with that of coke oven gas. We should, therefore, expect it to be interchangeable in much greater proportions than is the unmodified carburetted water gas.

To take another common example, assume that a coke oven gas system is newly changed over to natural gas, and that a large proportion of the coke oven gas capacity is sorely needed to carry the winter peaks.

The unmodified coke oven gas is not usable in the natural gas system in a very great proportion. A glance at the chart suggests that a mixture of coke oven gas and propane with a slightly higher heat value than natural gas would make an excellent supplementary fuel. Lay a straight edge on the chart from E to P and draw the line EP. Where this line cuts the interchangeability curve passing through L indicates a mixture of 1100 Btu and .72 gravity approximately.

The slow burning propane will offset the somewhat high flame speed of the coke oven gas, while the clean burning tendency of the latter will offset the tendency of propane to give yellow tips.

3. Use an LP-gas-air mixture of correct proportions, which may prove the most economical supplementary fuel, when raw fuel, labor and overhead on plant investment are considered.

Since both LP-gas and air are of relatively high specific gravity, matching the specific gravity of the base load gas with an LP-gas-air mixture is out of the question. We must, therefore, compensate the high specific gravity with a higher heat value of the LP-gas-air mixture and endeavor thus to secure as high a degree of interchangeability as possible.

DETERMINING INTERCHANGEABILITY IN ADVANCE

1. Before LP-gas-air mixtures are fed into a gas system in any great proportion, it is well to determine the optimum mixture for the purpose.

This may be done by an actual laboratory experiment with representative appliances supplied by metered proportions of LP-gas and air. Such

a procedure is not too expensive and provides a good basis for the first trial sendouts. The mixture can be modified later, should operating experience so dictate.

2. The AGA interchangeability formula, as set forth in Research Bulletin No. 36, may be used.[1]

Stated briefly, the factors governing the interchangeability of the supplementary gas are: its relative ability to inspirate primary air; the rate of flame propagation in the primary mixture, which in turn governs the tendency of the flame to lift at high burner ratings or to flash back on turn-down; and the tendency to form yellow tips on the flame and to deposit carbon whenever the flames impinge upon a metal surface, which is a function of the chemical composition of the gas.

By burning various constituent fuel gases in special test burners and representative appliances, and by carefully observing results, the AGA Laboratory staff was able to evaluate numerically the above-named tendencies for the common fuel gases. The use of these factors in the manner set forth in Bulletin 36 should give a fair advance indication of the degree of interchangeability to be expected when natural gas is the base load fuel.

3. The so-called "Knoy Formula" may be used in calculating interchangeability,[2] *or simpler yet, the accompanying chart, which is based on the formula, may be used to obtain graphic solutions to interchangeability problems.*

The formula was developed several years ago by the writer while determining the optimum butane-air mixture to use as a supplement to natural gas. It was determined at this time both by experiment and by calculation that heat value and gravity of a gas could be compensated in such a way as to keep the heat value of the primary mixture constant. This was in keeping with the known gas laws, and with the principle of the conservation of momentum which Bureau of Standards workers had previously found to prevail in the air mixers of gas appliances.[3]

Bureau of Standard workers had also found that well adjusted appliances on either carburetted water gas or coke oven gas carried an average of 175 Btu per cu. ft. in the primary mixture.[3] The late R. W. Harper of Chicago reported the same value for natural gas and high-Btu oil gas. The writer therefore selected this heating value for the primary mixture as probably being the most representative for all appliances and for all gases.

Referring again to the chart, our theory is that any two gases falling on the same interchangeability curve or having the same C value will be interchangeable to a high degree, since each will maintain 175 Btu per cu. ft. in the primary mixture.

The question arises, "What about those appliances that are set to operate with 150 or 200 Btu per cu. ft. of primary mixture?" A few sample problems will demonstrate that those appliances would each retain its own heat value in the primary mixture for any supplementary gas obeying the formula. For this purpose, one may use the writer's primary mixture formula previously published in GAS.[4, 5]

Or working from the chart, assume an appliance is set for a 150-Btu primary mixture on gas L. Then $C = \frac{1050 - 150}{.64} = 1125$. Now follow the interchangeability curve, C = 1100 to the right until it intersects the propane-air line at 1430 Btu and 1.30 specific. Since L lies just below the curve, C = 1100, its interchangeable propane-air counterpart would fall just below the curve on the propane-air line, say at 1420 Btu and 1.30 specific gravity. We have now selected a propane-air mixture that is theoretically interchangeable with gas L for those appliances set for a 175 Btu primary mixture, since this chart was drawn for such appliances. How will this gas perform on an appliance set for a 150-Btu primary mixture?

As pointed out above, gas L has a C value of 1125 in this appliance. The 1420-Btu propane-air mixture will have a value of

$$C = \frac{1420 - 150}{1.30} = 1114.$$

On such an appliance the C value of the propane-air is only 1% less than on gas L, a difference so small that no trouble should be expected.

By using my primary mixture formula, referred to above,[4] it can be shown[5] that if the appliance has 150 Btu in the primary mixture on gas L, it will have 149 Btu in the primary mixture on the propane-air. The propane-air therefore appears to be approximately as interchangeable for the appliance set for a 150-Btu primary mixture as for those set for 175 Btu.

Likewise, it can be shown that an appliance set for a 200-Btu primary mixture on gas L will have 201 Btu in the primary mixture on the propane-air, and should, therefore, accommodate the mixture as well as the other burners do.

ABOUT THE AUTHOR

M. FRANK KNOY has had a broad background of experience in the fields of mechanical refrigeration and gas engineering. Since 1928 he has been a frequent contributor of feature engineering articles to various trade journals.

Mr. Knoy's formal education included a B.S. degree from Texas Christian and some graduate work in mechanical engineering at California Institute of Technology.

From 1921 to 1936, he was connected with various utility companies as operating engineer and efficiency engineer in steam-electric, gas and ice plants. From 1936 to 1944, he served as utilization engineer with the Municipal Gas Department, Long Beach, Calif. In 1944 he went to the Institute of Gas Technology as appliance engineer, and was later made supervisor of the appliance laboratory there. Since September, 1946, he has been with the Republic Heaters Co. of Chicago as research engineer.

In inaugurating operation of the butane-air standby plant at Long Beach in 1941, Mr. Knoy developed his gas interchangeability formula. This was published in the June, 1941, issue of GAS, and has since been widely used by gas men.

CHECKING THE FORMULA AGAINST FIELD EXPERIENCE

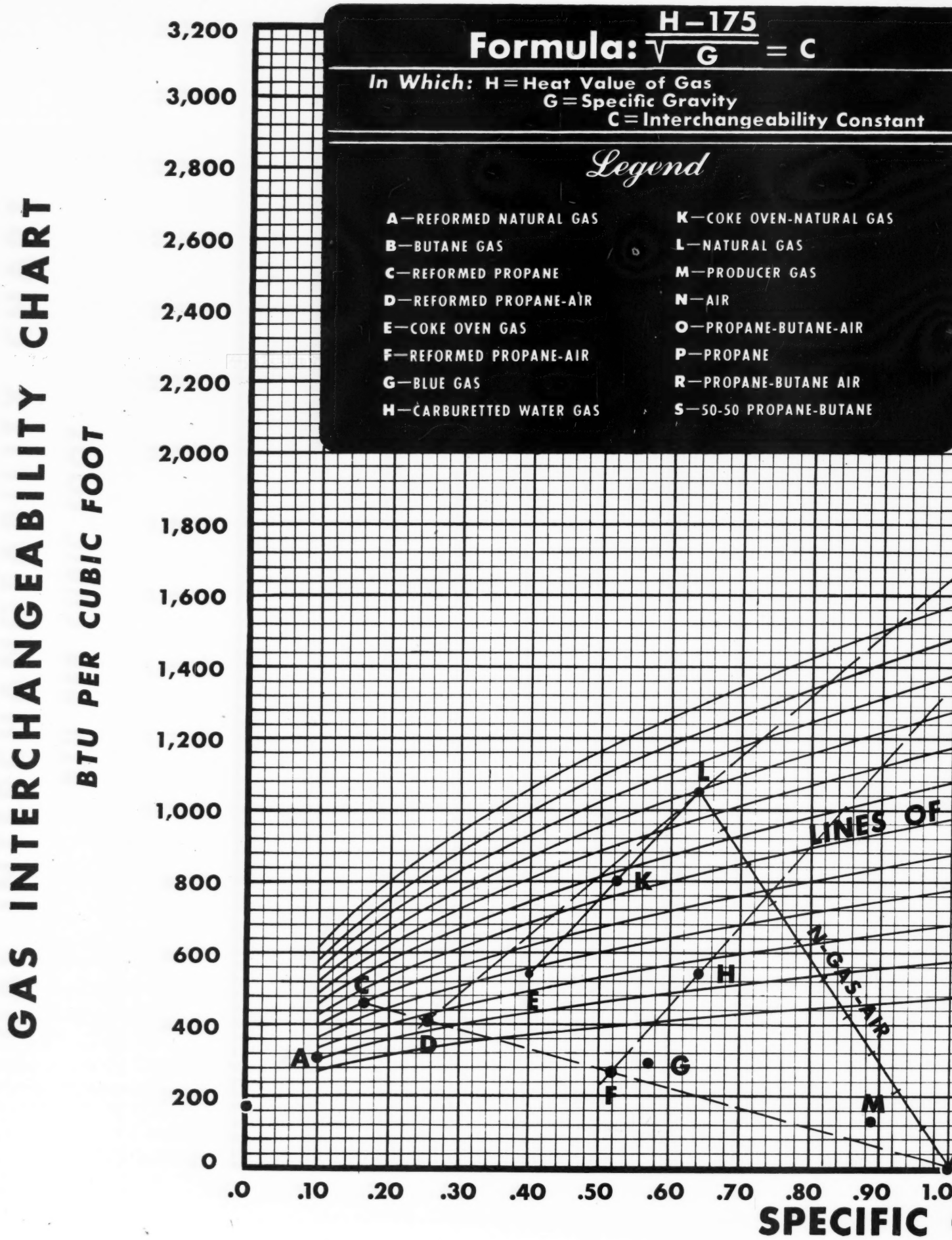
There is no proof for a theory or a formula that is quite as good as an actual field test. Since the above formula was published, there has been quite a bit of gas interchange experience published. Some of it is in keeping with the formula and some is not. Several published experiences may well be mentioned here.

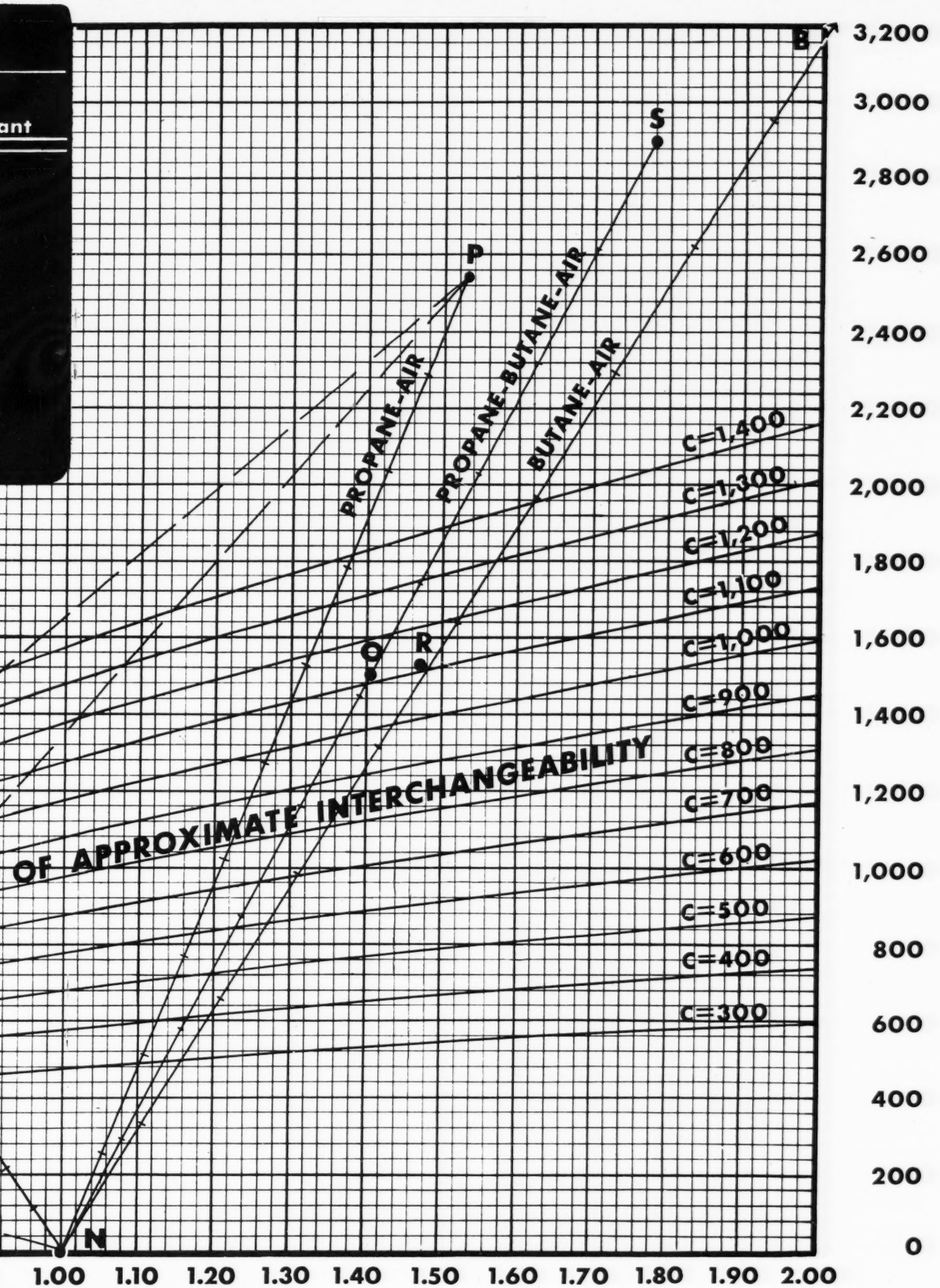
The experience at Long Beach, Calif., in substituting gas R for gas L on the chart has been successful.[5] For the past six years, mixture R has been sent out in various proportions up to 70% of the sendout in certain areas with no serious appliance trouble.

A. B. Lauderbaugh[10] reports that a propane-butane-air mixture of 1500 Btu and 1.44 specific gravity is successfully used in the Pittsburgh area to substitute for a natural gas very similar to gas L on the chart. The standby gas will fall midway between O and R on the chart and squarely on the interchangeability curve, C = 1100, passing near L. This is just the mixture we should have predicted from the chart and confirms our previous experience at Long Beach.

John J. Novy, of the Peoples Gas, Light and Coke Co., Chicago, has presented some interesting interchange data.[6] The Chicago base load gas is a mixed gas of 800 Btu and .54 specific gravity. It has a C value by the formula of approximately 850, and falls just to the right of point K on the chart, midway between the curves C = 800 and C = 900. Among the gases Mr. Novy reports as interchang-

GAS INTERCHANGEABILITY CHART





M. FRANK KNOY, research engineer, REPUBLIC HEATERS CO., Chicago, Illinois

HOW TO USE THE GAS INTERCHANGEABILITY CHART

For Mixing Gases

Each heavy circle on the chart represents one of the common fuel gases, as identified by the legend on the chart. Its position on the chart reflects its heat value, as read on the vertical scale and its specific gravity, as read on the horizontal scale.

Connect any two gases to be mixed by a straight line, as LE on the chart. Any mixture of coke oven gas and natural gas will have a heat value and specific gravity such that the mixture may be represented by a point falling upon the line LE. Thus, K represents a 50-50 mixture of the two gases, and therefore, falls at the midpoint, K, of line LE.

In *every case*, a mixture of the two gases will give a point falling somewhere on line LE.

By the law of inverse ratios, the distance of this point from E will represent the proportion of gas L in the mixture, and the distance of the point from L will represent the proportion of gas E in the mixture. Distances may be measured manually for this purpose, or read directly on the specific gravity scale, at the bottom of the chart.

Example 1: What gases mixed in what proportions will give us gas F on the chart?

Solution: Gas F lies on line CN and is, therefore, a mixture of reformed propane, C, and air, N.

The positions of the three gases on the specific gravity scale are: C=.165, F=.52, and N=1.00.

Proportions in the mixture are:

$$\text{reformed propane} = \frac{1.00 - .52}{1.00 - .165} \times 100 = 57.5\% \text{ approx.} \quad \text{Air} = \frac{.52 - .165}{1.00 - .165} \times 100 = 42.5\% \text{ approx.}$$

Example 2: What proportions of propane, P, reformed propane, C, and air, N, would be required to yield a mixed gas of the same heat value and specific gravity as natural gas, L?

Solution: From P draw line PL and extend it to intersect line CN at some point, as D. D represents a mixture of reformed propane—air. The proportions of reformed propane and air in mixture D may be determined in the same manner as was used for mixture F in Example 1, above.

We now have a mixed gas D which may be mixed with propane P to give a heat value and specific gravity represented by point L, since L falls directly upon line PD, by construction.

Positions on the specific gravity scale are approximately: D = 2.55, L = .64 and P = 1.53.

Proportions of D and P in mixture L may then be calculated as in Example I, above. Thus,

$$\text{Propane} = \frac{.64 - .255}{1.53 - .255} \times 100 = 30\% \text{ approximately.}$$

$$\text{Mixture D} = \frac{1.53 - .64}{1.53 - .255} \times 100 = 70\% \text{ approximately.}$$

In like manner, a mixed gas of equal heat value and specific gravity with carburetted water gas H, may be obtained by enriching mixture F with propane.

For Interchanging Gases

Example 3: What mixture of propane—butane, S, with air, N, will be approximately interchangeable with natural gas L?

Solution: Follow the interchangeability curve, C = 1100, which passes through L, until it intersects line SN near point O. Thus a propane-butane-air mixture of heat value 1480 Btu and specific gravity 1.40 is indicated.

Proportions of propane-butane and air in the mixture may be determined as in Example 1, above.

Example 4: What will be the heat value and specific gravity of carburetted water gas, H, enriched with propane, P, to be approximately interchangeable with natural gas L?

Solution: The correct mixture will be represented by the point where the line PH intersects curve C = 1100. This falls at a heat value of 1250 Btu and a specific gravity of .95.

Table 1—SUPPLEMENTS FOR 800-Btu, .54-SPECIFIC GRAVITY MIXED GAS

KIND OF GAS	*Btu*	*Specific Gravity*	*C Value*	*Degree of Interchangeability*
Coke Oven Natural Gas Propane	830	.56	875	Good
Oil Gas	810-820	.575	845	75-80%
Oil Gas Water Gas	840-850	.63-.64	849	Good
Natural Gas Air	920	.68	905	Good
Butane-Air	1150-1200	1.37-1.38	833-873	45%
Propane-Air	1119-1270	1.23-1.26	855-885	Good

ing successfully with the base load gas are those in *Table 1*.

From these figures it will be seen that the C value of each substitute falls very close to that of the base load gas.

The natural gas-air mixture which has a C value 6% above that of the base gas is still within the limits of expected interchangeability. Spot these gases on the chart by their respective heat values and specific gravities and note how consistently they fall between the interchangeability curves passing on either side of the base load gas near Point K. Clearly, their interchangeability could have been foretold from the chart.

Turning now to the problem of substituting for the manufactured gases, we have some recorded experiences. The paper on this subject by E. G. Boyer of the Philadelphia Electric Co.[7] is an excellent report. He tells of good results in substituting propane-air for coke oven gas in strict accordance with our formula.

Leon J. Willien, now with the San Diego Gas and Electric Co., reports a successful 50 to 100% substitution of 610-Btu, .69-specific gravity water gas for a 520-Btu, .49-specific gravity coke oven gas.[5] By the formula, the C value of the base load gas was 492 while that of the supplementary gas was approximately 526. He thus increased the C value by about 7%. This, however, would be well within the limits of expected interchangeability as shown on the chart. We should note, however, that the change was in the direction of a higher C value when going from coke oven gas to carburetted water gas.

Another interesting experience related by Mr. Willien brought out the fact that in substituting a high-Btu oil gas for a high heat-value natural gas, it was necessary to decrease the C value by some 26% to eliminate yellow tips.

The late Edward A. Dieterle of Chicago and M. H. Kreimeier of the Illinois Electric and Gas Co. reported a substitution of propane-air for a 480-Btu, .74-specific gravity water gas at Du Quoin, Ill. Here it was found desirable to raise the C factor by approximately 25% when the town was changed over 100% to propane-air. At last reports this was being reduced to a C factor only 10 to 15% high. The worst offending appliances were being adjusted as the heat value of the propane-air was gradually reduced from day to day. Except in the case of a comparatively few old-style appliances and Rutz lighters, little difficulty was experienced with the substitute gas.

It is known that numerous other tests of the formula have been made, some of which have not been published. No doubt, other gas substitution experiences will be published as they accumulate.

THE CHART AS A REFERENCE FRAMEWORK

If a sufficient number of interchange experiences are marked on the accompanying chart, a path of successful experience will eventually be plotted across the page. The interchangeability curves may then be modified wherever necessary to conform to successful field experience.

We have cited sufficient examples above to indicate that some gases interchange very well in keeping with the formula, while for some substitutions the C value must be lowered and for others it must be raised. Several instances of either kind, when published, will tend to establish the direction and magnitude of the change in C value required for optimum interchangeability. The common fuel gases are so few in number that the gas engineer can readily learn their relative interchange relations. He can mark each successful published experience on the chart for future reference. In this manner, he can save himself any costly experiments or tedious calculations.

USING THE CHART TO CONTROL COMBUSTION CHARACTERISTICS OF MIXED GASES

Referring again to the chart, let's assume a city previously using carburetted water gas comparable to H finds itself supplied with sufficient natural gas, except for the winter space heating peaks.

We know from experience that the gas H can be enriched with LP-gas to be highly interchangeable with natural gas L. Note where line PH intersects the interchangeability curve passing through L. This indicates good interchangeability of a carburetted water gas-propane mixture of 1250 Btu and .96 specific gravity.

This mixture is preferable to straight propane-air: first, because it will have much less tendency to form yellow tips, due to the hydrogen and carbon monoxide supplied by the water gas; second, because it does not entail putting large volumes of oxygen into the gas system, and third, because the heat value is lower than it would be for an interchangeable propane-air, and the consumer will not be given so much free thermal value during the periods of substitution.

To carry this thought a step further, let's have the gas company crack some propane in a water gas machine[9] and obtain gas C for mixing purposes. Lay a straight edge from C to H. Select a point on this line where it crosses line PD. This point will represent a mixture of reformed propane, roughly 68%, and carburetted water gas, 32%. By adding approximately 27.5% of propane to this mixture we may derive a gas of heat value and specific gravity identical with L.

If this gas burns with too high a flame speed to substitute perfectly for natural gas, we can reduce the flame speed by using producer gas M, instead of gas H. If we choose to reduce flame speed still farther, we may use air N, instead of producer gas M.

Whether we used propane to enrich gas CH, gas CN or gas CM, we could end up with a mixed gas of heat value and specific gravity similar to L, but the combustion characteristics would be slightly different in each case. It is thus seen to be possible to "tailor make" a mixed gas from various constituents and control its heat value and specific gravity and

its combustion characteristics as well.

These few examples will serve to illustrate some of the possibilities of gas mixing, especially when several constituents are available. In the opinion of the writer these and many other mixtures will come into general use as the gas industry learns to shoulder its new responsibilities along with new and wider opportunities. We must yet learn to bear up under the house-heating load, now regarded in some circles as the "gas man's burden." The recent experiences of the Peoples Gas Light and Coke Co. and several others in using whatever gases are at hand to make a good supplementary gas indicate that the new art of gas substitution is fast becoming a science.

THE LONG RANGE VIEW ON GAS SUBSTITUTIONS

TO those with a vision of the future, it is apparent that our gas mixing days have only begun. It seems certain that the use of natural gas as a base load gas will spread to many more communities before the supply begins to wane. It appears likely that when this time arrives our chemists, chemical engineers and gas engineers will be ready with adequate supplies of a new high-Btu coal gas.

The same transcontinental pipe lines that carried natural gas to distant cities will some day carry coal gas, sometimes in the opposite direction. And so long as the mains are packed with a gas supply people will want to heat their homes with it. This will entail steep winter peak loads and will require the use of supplementary gases.

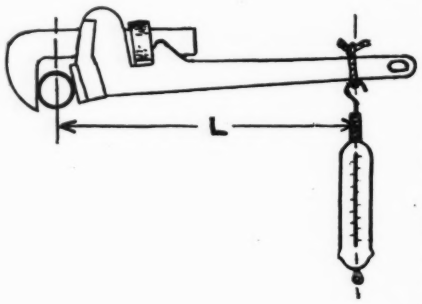
By an early beginning of industry-wide cooperation we can do much to forestall serious appliance troubles from fuel interchange and substitution.

Gas engineers and chemists should continue an intensive study of interchangeability. All information of a vital nature uncovered should be published and shared. Every effort should be made to make the supplementary gases used as truly interchangeable as possible.

Gas appliance manufacturers can do their share by learning something about supplementary fuels, and building into their appliances as wide a toleration for the common base load gases and the common supplementary gases as is possible. An appliance that has a critical adjustment on the base load gas and vary narrow toleration for the supplementary gas will some day meet with a cool reception from the gas utilities.

An Operating Kink

A LONG HANDLED PIPE WRENCH AND A SPRING SCALE are all the tools needed to set up a testing device to measure friction in rotating members. As an example, they may be employed to test packing on a centrifugal pump, and, with some mathematical computations, will tell the engineer whether he might do well to replace the packing he is presently using. They will indicate relative costs of comparative packings, and will point the way to possible savings.



PROCEDURE: Place a long-handled pipe wrench on the shaft, as indicated in the sketch, and at a measured distance "L" from the center of the shaft attach a spring scale. Then pull on the spring scale, causing the shaft to rotate, and note the amount of pull in pounds. The direction of pull, of course, must always be at right angles with the measured distance "L." Repeat the experiment several times, noting the reading on the spring scale each time until the correct amount of pull is established. Remove the packing, and insert whatever brand of packing is desired for the comparison.

Here it is well to operate the pump for a period sufficient to give the new packing a chance to become worn in. Even a week or a month may be optimum.

Then determine "Pull No. 2," the pull of the new packing. The following example will illustrate how "Pull No. 1" and "Pull No. 2" may be compared on a cost basis:

Given:
Pull No. 1 = 20
Pull No. 2 = 10
L = 20 in.
rpm of pump = 800
Subtract
Pull No. 2 from Pull No. 1 = 10
Multiply
Difference (10) x L (20) x rpm (800) x .0000159 = 2.54,
the amount of horsepower lost.

Converting the horsepower loss to round numbers (2½), consider the cost per year per horsepower. At $40 per hp. per year, the loss of horsepower through friction is costing 2½ times this amount, or $100.

The gas utility companies can forestall trouble for themselves by a more careful scrutiny of the appliances being connected to their lines. Only those of easy, uncritical adjustment should be considered acceptable.

When it is known that a contemplated supplementary fuel tends to burn rich and produce yellow tips, then company adjusters should be instructed to set all appliances slightly lean on the base load gas to increase their toleration of the supplementary gas. And vice versa: if it is known that the supplementary fuel tends to cause lean fires or lifting, a slightly rich setting of appliances on the base gas will save much trouble when the supplementary gas is used in quantity.

Increasingly heavy sendouts of the supplementary gas should be made at intervals during the autumn in order to discover the intolerant or maladjusted appliances in advance. Their readjustment at this time will avert an undue number of trouble calls during the winter peaks, when gas service men usually have all they can do anyway.

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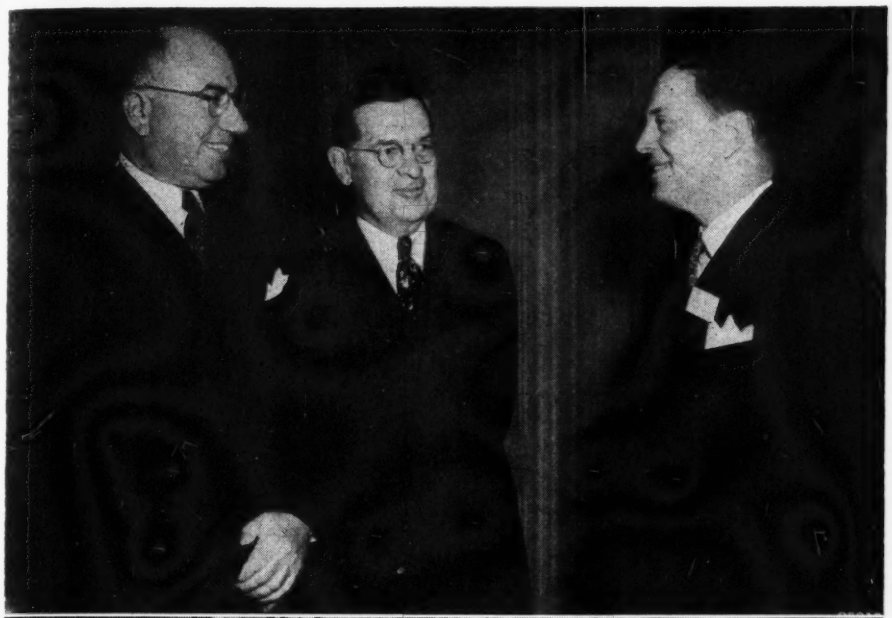
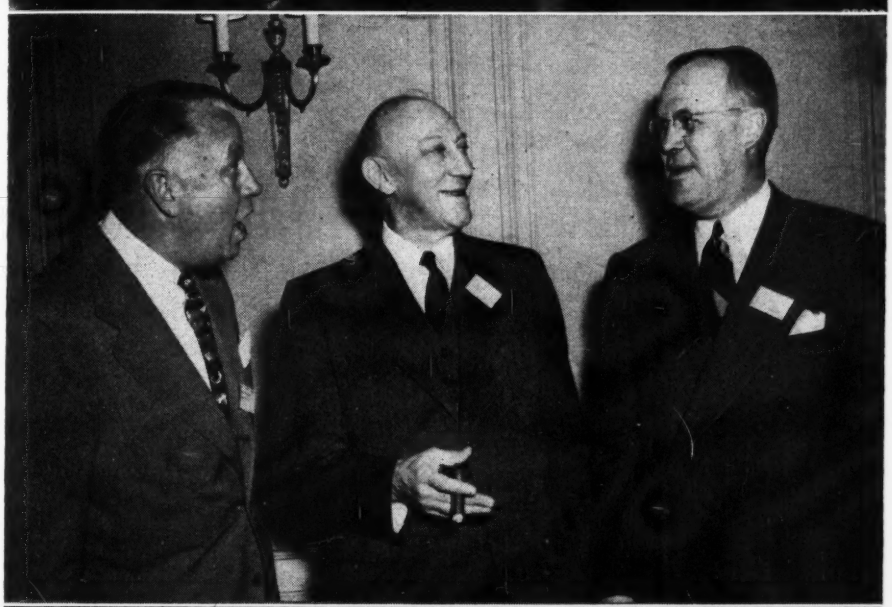
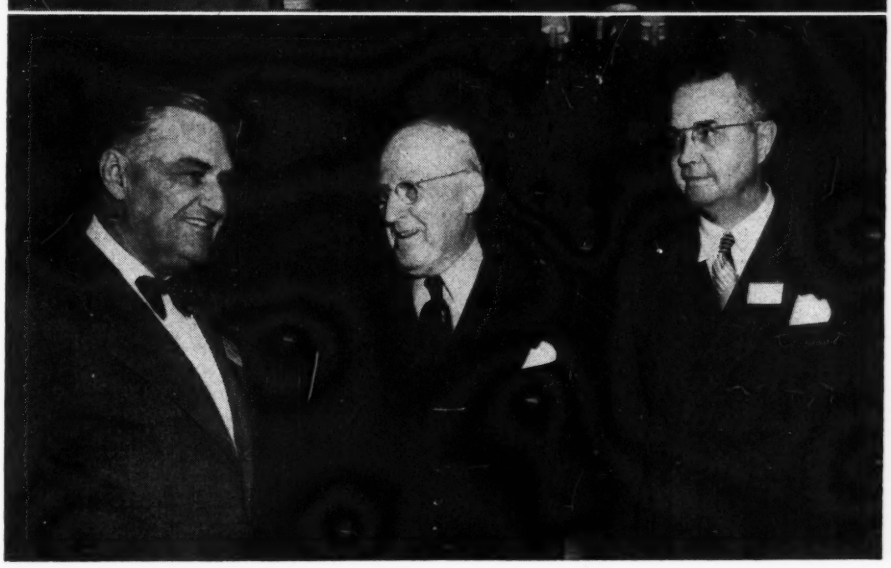






Fictured at Chicago: AT TOP, J. F. Robinson, East Ohio Gas Co., talks with I. K. Peck, Mfrs. Light and Heat, while F. H. Lerch, Jr., Consolidated Natural, looks on; CENTER, AGA's George Smith looks startled at what E. P. Noppel, Ebasco, and Chairman Hendee are saying; AT BOTTOM are H. M. Dow, Interstate Oil Compact Commission, R. E. Wertz, Amarillo (Texas) Gas Co., and C. H. Zachry, Southern Union.

ASSOCIATIONS

Spring Meeting

Natural Gas Department's conference winds up busy convention month

NEARLY six hundred gas men helped ring down the curtain on one of the heaviest convention months in gas history when they met AGA April 30 in a two-day session of the Natural Gas Department's annual spring meeting at the Hotel Stevens, Chicago.

With dispatch becoming harried executives in a troubled era, they came, sat intently through two full days of talks and discussions, and quickly dispersed at the close of business May 1. Many had come directly the night before from an executive conference in Milwaukee where shortages, curtailments, regulation, and other of the manifold problems of the day had been given full dress.

Nonetheless, it was an interested group that heard Irving K. Peck, Ernest O. Thompson, Hiram M. Dow and other leaders speak, and that joined in discussions at two sessions of the transmission committee and one of the accounting committee.

Best remembered for its information and entertainment qualities was the frank talk by the forthright Col. Thompson, chairman of the Railroad Commission of Texas, who wrangled with the highly controversial subject of flare gas wastage. "What Is Being Done to Eliminate Flare Gas Wastage in Texas" was the subject of his talk, and his answer was a pat "plenty!"

Seligson Shutdown

Straying frequently from his prepared address, the colonel traced the history of conservation in Texas through to the climax April 1, when by commission fiat the Seligson field was ordered shut down for failure to observe orders to halt excessive flaring of gas. (Operators later obtained an injunction against the order.)

"With 596 wells in 42 horizons, the field was flaring 38 MMcf of gas and 1185 barrels of liquid hydrocarbons. A year ago the commission warned operators that they must curb this excessive wast. They asked for a year in which to do the job—we gave them a year. They did nothing. And meanwhile other fields had already curbed waste."

The timeliness of the subject was

pointed out in Col. Thompson's revelation that although the war had stepped in and prevented acquisition of the necessary materials for flare gas conservation, "we have started full tilt to get fuller utilization of flare gas.

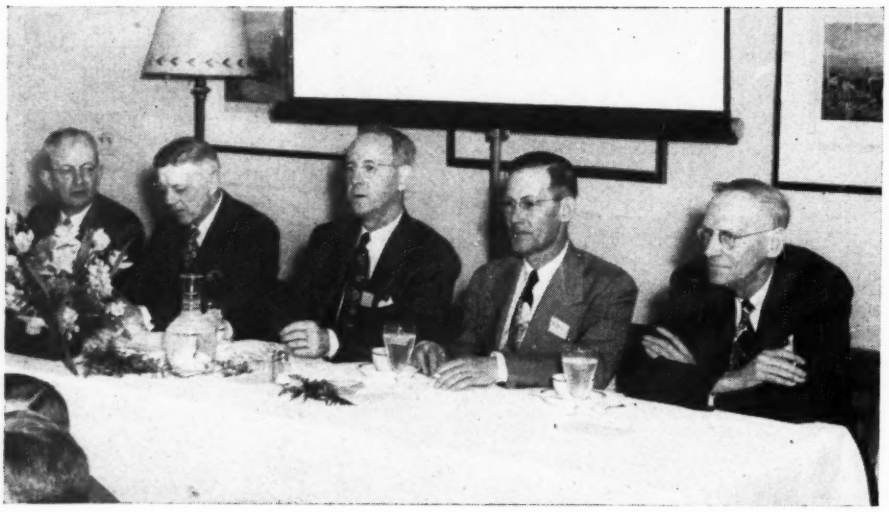
"You gentlemen hold the key to our complete achievement of the goal public opinion has set. It is this: the fruits of conservation must be given first place in the market for gas and the liquid hydrocarbons recovered in this conservation effort."

Col. Thompson reaffirmed his stand favoring free movement of gas as a conservation measure. "You can't move an industry to the gas wells," he said. "There must be a free flow from one section of the country to another, as with other commodities. Why not let easterners enjoy the many benefits of natural gas? By the time the supply plays out, there will be plenty of coal being gasified, and the pipes can be made to flow the other way."

Aspects of the "unprecedented" nation-wide demand and prospects for the future were outlined in summarization of the house heating load presented by Irving K. Peck, vice president and general manager of the Manufacturers Light and Heat Co., Pittsburgh. The information was compiled from a survey of major gas utilities, through the medium of questionnaires on saturations and peak day ratios.

Saturation figures showed a not-too-startling increase expected during the next decade. Some of the figures themselves were eye-opening, however. From a present average figure of 3½% with a projected 7-10% figure in New England, the percentages varied to a 16% present load and 50 to 60% projected percentage in the middle eastern section. Some larger companies have 25% to 50% now and expect up to 75% before long, he pointed out. But all sections —except Southern California, which has few central heating systems and nearly 100% saturation in heating loads—showed one factor in common —an expected increase, and of sizeable proportions.

General observations showed that during last winter insufficient distribution capacities added to transmission equipment shortages to bring about restrictive practices; LP-gas installations did not prove as effective as they might have because delivery of liquefied gases was short, and costs of LP-gas installations doubled. Although management in manufactured gas areas was not particularly bothered by the high cost of butane and propane installations, sellers of natural gas found the cost disturbing because of their low prevailing rates. In most cases, he said, either underground storage or summer supply has been insufficient, and effecting higher and higher pressures is costly.



AT CLEVELAND. Right, K. R. Knapp, AGA lab.; C. S. Goldsmith, Technical Section chairman. Below, J. T. Ray, E.E.I.; T. C. Smith, Amer. Tel. & Tel.; B. D. Connor and M. C. Alves, chairman and vice chairman, Motor Vehicle Comm.; and Goldsmith.

Ginna Speaks

R. E. Ginna, vice president, Rochester Gas & Electric Corp., adding his comments on the house heating outlook, stressed the tremendous market potentialities forecast during the next few years, with families due to increase rapidly. And, although architects have been sold on gas, since they cannot get a definite promise as to when gas will be available they are installing oil-fired equipment in new homes. To combat this, he recommended a strong public relations program.

Hiram Dow, chairman, Interstate Oil Compact Commission, outlined the work of the commission in helping to promote conservation, presenting an enlightening picture of the commission policy.

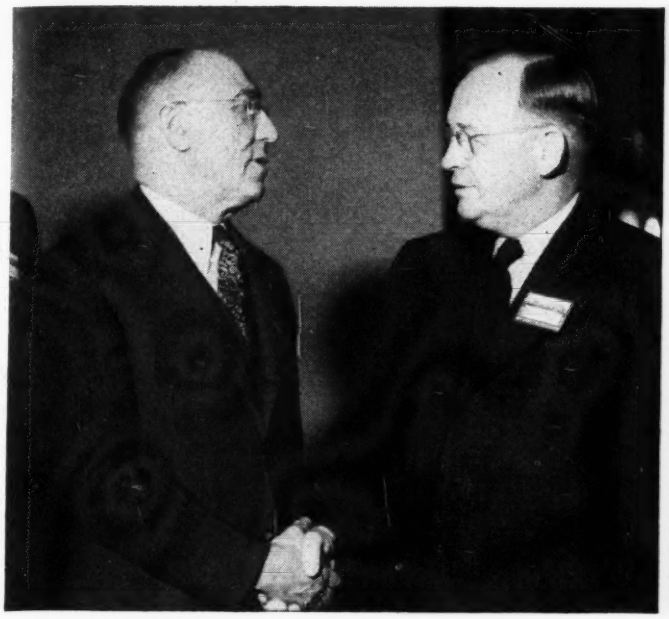
Other topics of interest presented at the general sessions included an interim report on the Subcommittee on Pipe Line Flow presented by J. W. Ferguson, Bureau of Mines, who stressed research into the effects of relative roughness of pipe; a research report by H. D. Hancock, chairman, Technical and Research Committee, and a two-ply symposium on underground storage, with E. G. Dahlgren of the Interstate Oil Compact Commission presenting information on the extent to which this form of storage is utilized, and Fred Hough, Southern Counties Gas Co., showing the importance of such projects.

Joint Conference

600 Gather for Distribution And Vehicle Sessions

HOTEL Cleveland, Cleveland, Ohio, was the site, April 14-16, of the 23rd Annual Distribution Conference and the 6th Conference on the Operation of Public Utility Motor Vehicles, sponsored by the Technical Section. Six hundred engineers and motor vehicle fleet operators attended the meetings presided over by J. H. Collins, general superintendent, gas department, New Orleans Public Service, Inc., and chairman, AGA Distribution Committee, and B. D. Connor, superintendent of transportation, Boston Consolidated Gas Co.

Chairman Collins and H. Carl Wolf, in their addresses at the first general session, stressed the fact that distribution systems must be prepared to handle greater loads, more



MIDWEST GAS ASSOCIATION PRESIDENTS. At left, the new president, E. J. Otterbein, Davenport, Iowa, is congratulated by Retiring President E. C. Deane, Sioux Falls, S. D. At right, line-up of past leaders: FRONT ROW, H. K. Wrench (1943), Harold Peckham (1942), H. J. Carson (1925); SECOND ROW, R. L. Klar (1934), C. B. Dushane, Jr. (1941), John Drabelle (1931), C. T. Williams (1935); BACK ROW, Deane and A. W. Borden (1919). Photos were taken at annual convention, Omaha, April 7-9.

economically than ever before. Hudson W. Reed, president, The Philadelphia Gas Works Co., and AGA first vice president, speaker at the general luncheon for all delegates on the second day, contrasted past practice with present-day distribution conditions caused by revolutionary changes in appliance design and the characteristics of the house heating load.

Of special interest to the motor vehicle operators was a talk on driver education by W. F. Brown, safety director, Consolidated Edison Co. of New York, Inc., who outlined the selection and training program of his company. The job classification plan of Cincinnati Gas and Electric Co. was described by James A. Whelpley of that firm.

Results of a survey covering 117 gas companies operating 11.5 million service lines, or more than one-half of the gas industry in the U. S., were reported by E. L. Henderson, United Gas Corp., Houston, chairman of the Subcommittee on Construction and Maintenance, in an address titled "Installation of Gas Service Piping."

Round-table luncheon meetings were held on five topics: meters and metering, construction and maintenance combined with distribution, work on consumers' premises, pipe coatings and corrosion, and motor vehicle.

ACCOUNTING MEET

In the event of a depression, gas and electricity utility bills will not be in the same ratio to income of consumers as they were in the last depression, G. A. Wilson of the Public Service Electric & Gas Co. of New Jersey declared in Buffalo recently.

Leading a discussion on customer collections during a session of the AGA-Edison Electric Institute Accounting Conference at Hotel Statler, Wilson explained that unemployment insurance, guaranteed incomes, and lower utility rates would minimize the "uncertainty" of financial ability of consumers to pay for the services in a depression.

Those participating in the talks advocated a continuation of the "liberal collection policy" of gas and electric utilities in the event of an adverse economic change. They contended that such utilities were "duty bound" to provide customers with uninterrupted service.

AGA NOTES

Recognition for winners of two new AGA- conducted contests will be made at the annual convention in Cleveland. There will be five prizes, totaling $1000, for each group.

Awards of $500, $250, $150, $50 and $50 will be presented to individuals who have done the most to create, maintain and increase consumer demand for gas heating. This new annual contest, sponsored by The Coroaire Heater Corp., is to be known as the AGA Gas Heating Progress Award. The competition is open to any executive or employee of any gas utility, holding or service company member of the AGA, or individual members with the exception of employees of gas appliance manufacturers. Entries should be addressed to AGA headquarters and must be postmarked not later than June 30.

Winners of the AGA Home Service Achievement Award, to be sponsored annually by McCall's Magazine, will receive five $200 prizes for achievement by home service departments in the areas served by their companies and for ideas submitted by individuals and judged to have contributed most to the advancement of modern homemaking by promoting interest in and better use of gas and modern gas equipment in the home. One award will be given for companies with more than three persons in the home service department, one for companies with at least one but not more than three, and three prizes for individual members of departments in three different companies.

For the first time in its history the AGA has published a 40-page, color book reviewing association activities for the past year. Officers and directors for 1945-46 are pictured, and the entire book is freely illustrated with charts, graphs and photographs. A section is devoted to each phase of association endeavor, and a complete record of the organization's income and expenditures is included.

Jean Clarke Thompson, recently appointed to the Publicity Bureau, will direct all domestic gas equipment publicity and services covering the use of gas equipment in homes for national magazines, women's pages of newspapers and women's radio programs.

South Sets Sails

Optimism marks Southern Gas Association meet; 1000 delegates attend.

IN an atmosphere of optimism and opportunity, 1000 delegates from 40 utilities from below the Mason-Dixon line gathered to participate in the 36th annual convention of the Southern Gas Association, April 16-18 in Biloxi, Miss.

SGA

Under the banner, "Set Sail for Sales," the producers and distributors of 70% of the nation's natural gas spent two of the busiest days of their lives considering ways and means of putting gas in the top spot among the country's fuels. Busy days they were for attendants who desired to absorb even a small percentage of the information aired in the heavy program.

Launched by a Home Service Workshop on Wednesday, April 16, the conference included the following gatherings: on Wednesday, home service and general luncheons, all-day accident prevention round table, and afternoon Industrial Sales and Commercial Sales Round Tables; on Thursday, a general session, Sales and Industrial and Commercial Section luncheon, Operating and Accident Prevention luncheon, and Accounting Section luncheon, and afternoon meetings of Operating, Industrial and Commercial, and Accounting Section; and on Friday, a general session in the morning followed by a general luncheon, and further meetings of the sections.

Strickland Keynotes

Dean A. Strickland, retiring president of the association, keynoted the meeting with a plea for continued and augmented research to widen the uses for gas throughout the South and Southwest. Bolstered with a $4.5 million research and development fund, the industry in those areas is poised for a 13-state program to support the South's war-born industrial growth.

Charles I. Francis, Houston attorney and a director of the newly-formed Texas Eastern Transmission Co., reviewed trends in regulatory practices. Discussing the bills now pending in Congress which are intended to alter the jurisdictional limits of the Federal Power Commission, he strongly advocated industry backing of the Rizley Bill and denounced the Dolliver Bill. While the former seeks to define more clearly the limits beyond which the commission cannot extend its domain, the Dolliver bill is a "pernicious" attempt to give the commission virtual power to regulate the industry from "the bottom of the well to the burner tip."

He viewed with pleasure the action of the Louisiana legislature in repealing its "state policy" of opposing movement of gas past its boundaries.

"Louisiana," he declared, "has thus joined the ranks of those states which believe that natural gas is entitled to the benefit of an interstate market, and that it is unwise to endeavor to Balkanize this nation through . . . (fostering) the economic advantage of special groups."

Citing the growth of national income from $71 billion in 1940 to $164 billion in 1946, of the value of manufactured products from $88.6 billion to $194 billion, and of manufacturing payrolls to an index of 260.7, R H. Hargrove, in a paper presented in his absence by Frank C. Smith, told of the effects this tremendous change would have in the gas industry:

"The industry is facing a new era in the standard of living and the time is here to begin thinking of new standards of public acceptance of gas. What this may mean is an overhauling of rate structures, new concepts of service, and regulation which would sanction as prudent investment the cost of those facilities necessary to meet the demands of an all out market in this new era.

TOP PHOTO: D. A. Strickland, United Gas Corp., retiring president, at left, with new SGA head, W. L. Woodward, Alva, Okla. At rear, in hat, W. H. Carson, U. of Oklahoma. BELOW, F. C. Smith, Houston Natural, reads AGA Pres. Hargrove's address.

"We must give better service at fair cost."

Other items of interest in the general sessions were the managing director's report by R. R. Suttle; an address by H. Carl Wolf, A.G.A. managing director, on "National Planning for Local Profits"; Labor Relations or Employee Relations," by W. H. Senyard of New Orleans, and "Are There Clouds on the Business Horizon?" by A. von Wening, A. O. Smith Corp.

Workshop

Home Service women meet at Mount Hood, Ore.

TIMBERLINE Lodge atop Mount Hood at Timberline, Ore., was the scene of the PCGA-AGA sponsored **PCGA** Home Service Workshop held April 1 and 2. Conference chairman was Rita Calhoun, home service director, Portland Gas & Coke Co., and chairman, PCGA Home Service Committee.

There were two luncheons for the entire group, which consisted of representatives of seven west coast utilities and a number of speakers and guests, with the PGGA as host. The AGA's "Miss Flame" history of the

industry in comic book style was introduced at the workshop, and the Bendix gas laundry dryer made its Pacific Northwest debut under the direction of Frances Alexander, home economist for the Harper-Megee Co., Portland appliance distributors.

Jessie McQueen of New York City, AGA home service counsellor, gave an address stressing the need for attracting young women to the gas company home service field.

Coronado Plans

The Texas-to-California line, sometimes referred to as the "Biggest Inch" and widely heralded as one of the outstanding feats of pipe line engineering in industry history, will be the theme of the 54th annual convention of the Pacific Coast Gas Association, President Leroy M. Edwards has announced.

L. M. Edwards

Two featured addresses will focus attention on the project. From the eastern end of the line, President Edwards has obtained Paul Kayser, president, El Paso (Texas) Natural Gas Co., who will enlighten Pacific coast men on the operations accomplished by his company, which is laying the line as far as the California border. From the pipe fabrication industry, Edwards has drawn Alden Roach, president of Consolidated Steel Corp., Los Angeles, who are turning out the high-pressure 30-in. line.

The talks will hold added interest in view of the fact that completion of the job is scheduled for Nov. 1, less than six weeks following the convention. The PCGA is scheduled to meet at Hotel Coronado, Coronado, Calif., Sept. 23-25.

President Edwards also revealed that there will be no section meetings, all attention being devoted to the general sessions.

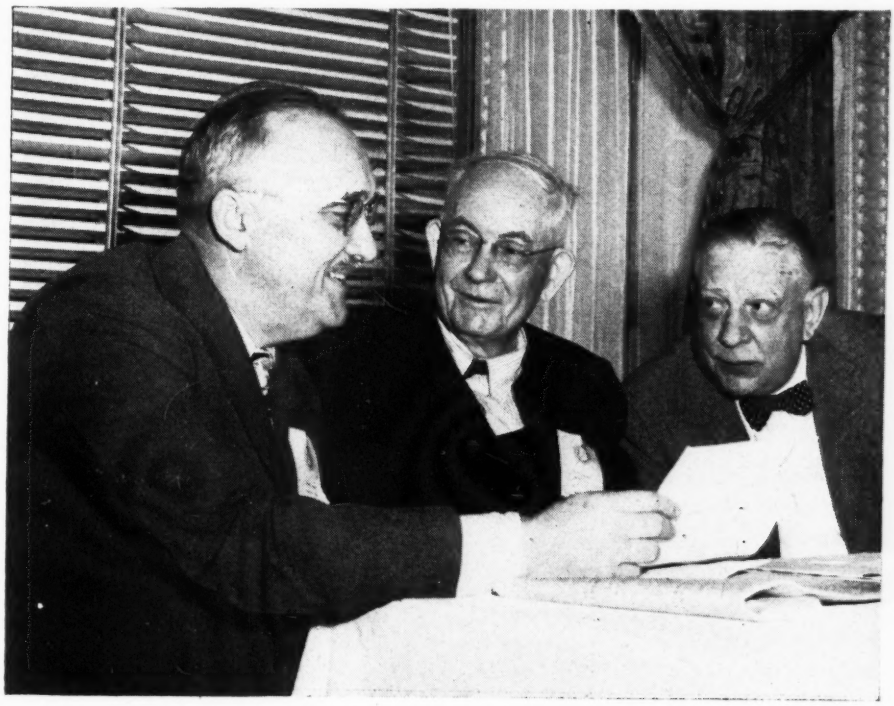
OTHER ASSOCIATIONS

Florida-Georgia

H. P. Thomas, Miami Beach, vice president of Peoples Water & Gas Co., was installed as president of the Gas Meters Association of Florida-Georgia at the annual banquet at Boca Raton, Fla., April 26, attended by some 300 delegates and guests. Buell G. Duncan, Orlando, vice president of South Atlantic Gas Co., the association's retiring president, turned the gavel over to Thomas. Duncan automatically became vice president. J. W. Owen, Winter Haven, general manager of Central Florida Gas Co., took the post of secretary-treasurer.

Honor Warren

The Hanlon Award, highest honor in the natural gasoline and cycling industries and one of the ranking merit awards in the petroleum industry, was conferred on William K. Warren, president, Warren Petroleum Corp., Tulsa, Okla., at the annual convention of the Natural Gasoline Association of America held in Dal-



Scenes at the spring quarterly meeting of the Interstate Oil Compact Commission, April 24-26, at Birmingham, Ala. AT LEFT, representatives of two of the newest member states, Eugene L. Pearson, Nashville, Tenn. (left), and A. C. Colby, Indianapolis, Ind. (right), talk with W. M. Downing, Colorado. BELOW, Dr. R. J. Gonzales, Houston, Texas, chairman of the commission's Economic Advisory Committee, and Alec M. Crowell, who recently resigned as director of the production branch of the Oil and Gas Division, Department of the Interior, to assume vice presidency of the Texas Eastern Transmission Corp., new operators of the Big and Little Inch lines.

las, April 23-25. Warren is the 11th recipient of the Hanlon Award, which is sponsored by the NGAA each year for outstanding service to the natural gasoline and cycling industries.

New NGAA officers elected at the meeting are: C. R. Williams, Chicago Corp., Corpus Christi, president; James E. Pew, Sun Oil Co., Philadelphia, vice president; William F. Lowe, Tulsa, secretary-treasurer; and Albert H. Weil, United Gas Pipe Line Co., Shreveport, and Henry M. Brown, Midland Gasoline Co., Houston, vice presidents.

EXPANSION

Big Inch

Petitioners clamor for its gas; Texas Eastern plans boost in output.

Texas Eastern Transmission Corp., Houston, operator of the Big and Little Big Inch lines, plans to boost delivery to 250 MMcf per day (principally to the Appalachian area and to customers served by Tennessee Gas and Transmission Co.) by adding a number of compressor stations to the system. Present delivery is about 140 MMcf daily. Hearings were scheduled to begin this month on Texas Eastern's application for a permanent certificate to operate the lines. If a certificate is granted, the company is expected to pay an additional $40 million in further installations to increase delivery.

The FPC recently extended its allocation of gas from the lines to cover the interim period during which Texas Eastern has permission to operate them. The allocations were originally set up to terminate on April 30, expiration date of the lease under which Tennessee Gas and Transmission operated the lines.

(T.G.T. transported 17 billion cu. ft. of gas to the Appalachian area during the winter months. The company now has a large construction program under way in seven states, laying a parallel line to the Appalachian area. If an application now pending before the FPC is granted, T.G.T. will be able to transport 600 MMcf daily through its own system.)

In mid-April the FPC authorized United Gas Pipe Line Co., Shreveport, to sell gas to Texas Eastern for a period of nine months, beginning May 1. The gas is being delivered from United's Carthage-Sterlington line at a point in Louisiana where the line crosses the Little Big Inch. Such sales are to be made only after United has filled all other commitments from its line.

Meanwhile, protests against expansion of the lines until present customers are adequately supplied, and applications for more "Inch" gas have flooded the FPC. For example:

A letter to the commission from Milo R. Maltbie, chairman of the New York Public Service Commission, declaring that the PSC is opposed to proposals for extension of the lines to new areas or to additional customers until an ample supply for New York state, under the most adverse weather conditions, is assured.

A bid by consumers in Indiana and Missouri for a share of the gas.

Intervention filed by 24 railroads.

Statement by the Public Service Commission of Missouri that if natural gas is to be piped through the state, it should first be made available to Missourians.

Application by New York State Natural Gas Corp. for authority to construct a compressor station and connections where the Inch lines and the company's lines cross in Greene county, Pa., to permit the company to receive Inch gas.

Application by United Natural Gas Co., Oil City, Pa., to extend its facilities to receive the gas. A 71-mile, 20-in. line is proposed.

Hearing Set

FPC ponders East Tenn., Southern Natural dockets

Hearing was set for May 26 on applications filed by Southern Natural Gas Co. and East Tennessee Natural Gas Co. for authority to construct and operate new facilities. Southern Natural has requested authorization to increase its system capacity from 255 MMcf to 384 MMcf daily and to serve new markets in Tennessee, Mississippi, Alabama and Georgia. East Tennessee Natural, a recently-organized company, successor to Tennessee Natural Gas Lines, Inc., proposes to construct and operate facilities having a daily capacity of about 62,325 Mcf for delivery in Chattanooga, Knoxville, and surrounding areas.

Facilities proposed by Southern Natural include one group to be completed in 1947 and a second group to be constructed during 1947-48. The first includes the addition of 8000 hp to compressor stations along the company's main line, and construction of 34 miles of pipe line. Five new compressor stations totaling 37,000 hp. two branch line compressor stations

CALENDAR

June

American Gas Association Joint Production and Chemical Committee Conference—Hotel New Yorker, New York City, June 2-4.

Institute of Cooking and Heating Appliance Manufacturers — Netherland-Plaza, Cincinnati, June 2-4.

National Warm Air Heating & Air Conditioning Association — Edgewater Beach Hotel, Chicago, June 5-6.

Canadian Gas Association—General Brock Hotel, Niagara Falls, Ontario, Canada, June 9-11.

American Gas Association Southwest Personnel Conference — Peabody Hotel, Memphis, June 11.

American Society of Mechanical Engineers, Semi-Annual Meeting—Chicago, June 16-19.

American Gas Association Residential Gas Section, New York-New Jersey Gas Sales Conference—Essex and Sussex Hotel, Spring Lake, N.J., June 23-24.

July

Michigan Gas Association—Grand Hotel, Mackinac Island, Mich., July 7-8.

August

Appalachian Gas Measurement Short Course—West Virginia University, Morgantown, Aug. 25-27.

September

American Society of Mechanical Engineers, Fall Meeting—Salt Lake City, Utah, Sept. 1-4.

Pacific Coast Gas Association 1947 Convention—Coronado, Calif., Sept. 23-25.

October

American Gas Association Annual Convention—Cleveland, Ohio, Oct. 6-8.

National Safety Congress and Exposition—Chicago, Oct. 6-10.

National Metal Congress and Exposition—Amphitheater, Chicago, Oct. 20-24.

November

National Hotel Exposition — Grand Central Palace, New York, N. Y., Nov. 10-14.

December

American Society of Mechanical Engineers Annual Meeting — Dec. 1-5.

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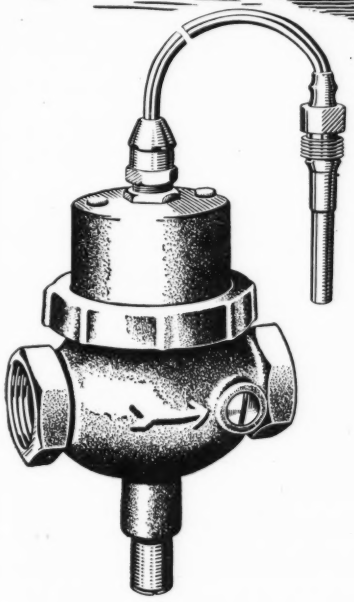

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totaling 3600 hp, and one additional 1000-hp unit, as well as 14 miles of 20-in. and 33 miles of 12¾-in. loop line, are proposed for the 1947-48 program.

East Tennessee Natural requests authority to construct 186½ miles of 16-in. line from Tennessee Gas & Transmission Co.'s line to a point near Chattanooga, and about 112 miles of 12¾-in. line from that point to near the city limits of Knoxville, with laterals to various nearby communities.

Intervention

Panhandle Eastern Pipe Line Co., the National Coal Association and United Mine Workers of America, the City of Detroit, the Michigan Docks Association, et al., and 78 railroads, all intervenors in the Michigan-Wisconsin Pipe Line Co. proceedings before the FPC, applied late in April for reconsideration and vacation of the FPC order of Nov. 30, 1946, as modified, which issued a certificate of public convenience and necessity to Michigan-Wisconsin. As an alternative, the intervenors requested a re-hearing.

The order authorized Michigan-Wisconsin to construct a pipe line system extending from Texas to a point in Michigan, on condition that the facilities were not to be used for the transportation or sale of gas to the Michigan Consolidated Gas Co. for resale in Detroit and Ann Arbor, Michigan, except with due regard to the rights and duties of Panhandle Eastern Pipe Line Co. A supplemental order, adopted by the commission on Feb. 20, 1947, determined Panhandle's rights and duties.

Lone Star Budget

Lone Star Gas Co. anticipates expenditures of more than $9.5 million for extensions and additions to physical properties this year to meet growing requirements for service, President D. A. Hulcy has announced. This amount has been budgeted for construction and equipment over the gas system, comprising 321 cities and towns in Texas and Oklahoma. Some of the projects are under way, while others will be started when materials are available, Hulcy said. Following are the principal expenditures:

Service lines, street mains, meters, regulators and other facilities for serving customers, $3,279,513; acquiring leases and drilling wells, $2,560,230; pipe line construction from and in gas fields, $1,732,100; dehydration, cycling and gasoline plants, $1,071,650; supplementing existing facilities, such as machinery and building improvements, $986,105.

In West Virginia

Temporary authorization to the United Fuel Gas Co. to construct and operate 70 miles of 20-in. transmission line and appurtenant facilities in West Virginia was granted by the FPC in April. Installation, at a cost of $2.9 million, will complete a single high-pressure line from Cobb compressor station, Roane County, W. Va., to a connection with the Manufacturers Light and Heat Co. line in Monongalia county, W. Va., and will enable the company to deliver increased supplies to the Pittsburgh Group of the Columbia Gas & Electric Corp.

With completion by June 1 expected, the new facilities will permit summer storage by the Pittsburgh group for next winter's peak loads.

Chicago District

The Chicago District Pipeline Co. has asked the FPC for authority to lease two pipe lines, certain regulating and metering facilities, and two lateral lines, all in the vicinity of Chicago, from the present owner and operator, The Peoples Gas Light and Coke Co., which purchases gas from Chicago District for distribution in the city. Chicago District claims that by providing for continuous supervision, operation and control of the facilities, conditions under which its natural gas transportation system is now being operated and maintained will be improved. The lease would be for the term of one year and from month to month thereafter.

Central Kentucky

The Central Kentucky Natural Gas Co. has applied to the FPC for authorization to construct facilities to be used to deliver additional natural gas to The Cincinnati Gas & Electric Co. and The Union Light, Heat & Power Co. to meet estimated peak day requirements for the winter seasons of 1947-48 to 1950-51. Cost of the facilities has been estimated by Central Kentucky at $1,933,000. Construction was planned to begin not later than June 1, depending upon receipt of pipe and other materials from suppliers.

Central Kentucky now delivers the gas which it sells to Cincinnati and Union through facilities which terminate in a single 20-in. line with a measuring and regulating station at Johns Hill, Ky. The maximum daily capacity of these facilities is approximately 92 MMcf. Estimated requirements for gas deliveries during the 1947-48 winter from Central Kentucky to Cincinnati and Union total 123.2 MMcf, or 31.2 MMcf more than the capacity of the present facilities. To meet the additional needs, Central Kentucky has asked authorization to construct approximately 23 miles of 24-in. gas transmission pipe line.

Southern California Gas Co., Los Angeles, has announced plans to spend $300,000 this year on the simplification and improvement of its distribution system in the downtown area of Los Angeles. It is estimated that a total of 29,000 ft. of 8, 6 and 4-in. main will be required for the entire project. Two district regulator stations will also be installed. Attention is being given to the application of extra heavy protective coating which, it is hoped, will prolong the life of the pipe.

At the annual meeting of stockholders of San Diego Gas & Electric Co., President L. M. Klauber revealed that the company has placed an order for a new 50,000 kw steam turbogenerator. Construction of the $1.2 million gas holder has been temporarily delayed while consideration is given to the possibility of building a transmission line north to connect with the Texas-California line now under construction. The outcome depends upon negotiations with Southern Counties Gas Co., joint operators of the line.

Republic Light, Heat & Power Co. has revealed that Semet-Solvay Co. will build this year a new water-gas plant next to its coke ovens in Buffalo, N. Y. It will produce 8 MMcf of gas a day and will give Republic a total of 32 MMcf daily.

Semet-Solvay has abandoned plans, previously announced, to erect a new battery of coke ovens there to supply gas as a by-product. It will build the water-gas plant instead.

Ground breaking ceremonies were held recently at the site of American Radiator & Standard Sanitary Corp.'s new plant at Torrance, Calif., first major step in the firm's postwar expansion plans. The plant, which will have 497,000 sq. ft. of floor space and will employ about 600 people, is

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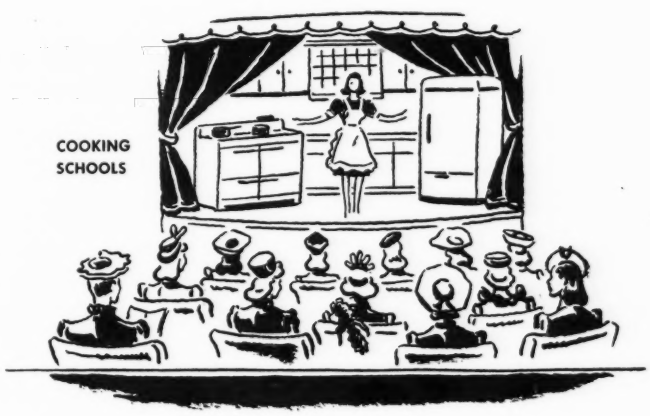

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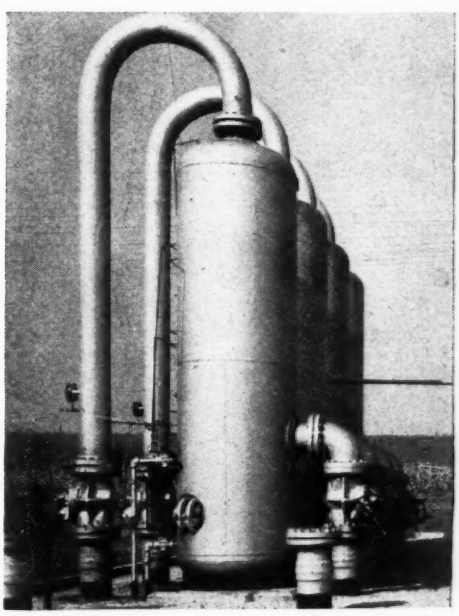

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to be a pottery for the manufacture of genuine vitreous china plumbing fixtures. Expected to be in production within six months, the plant will have four concrete continuous tunnel kilns, 20 supply silos and numerous auxiliary buildings, including a standby propane gas plant.

Plans to spend $365,000 on expansion of South Atlantic Gas Co. facilities in Central Florida this summer have been revealed by Buell Duncan, vice president. Improvements costing an estimated $250,000 are planned for the company's Orlando facilities, and more than $100,000 will be spent in erection of a new plant at DeLand, Duncan said.

Tentative plans for the doubling of production at the Clearwater, Fla., municipal gas plant have been announced by City Manager Boyd Bennett. The plant is turning out 1.75 MMcf daily, and production would be stepped up to 3.5 MMcf. Bennett hopes to get material for the installation of a 6-in. main to increase service now provided in Safety Harbor, Dunedin and Large.

Northern Indiana Public Service Co. has announced plans for a $2 million expansion of its South Bend, Ind., facilities to manufacture gas and mix it with natural gas now being supplied by pipe line from the Texas gas fields. The program was initiated in conformity with a recommendation by the Indiana Public Service Commission that no additional domestic heating service should be provided until more adequate production is provided. The new facilities are scheduled for completion about Jan. 1, 1948.

REGULATION

Industrial Sales

Fight looms in hearing on Industrial's application to take TG&T gas.

A fight over whether sales of gas should be made to an industrial user while a domestic shortage threatens is shaping up for the hearing scheduled by the FPC for June 12, on a petition filed by Industrial Gas Corp., Charleston, W. Va., asking that Tennessee Gas and Transmission Co. be ordered to sell gas to the petitioner at an existing interconnection of the two companies' lines.

Tennessee objects to issuance of the order on the grounds that it might operate to give Industrial undue preference over other Tennessee customers. An intervenor, United Fuel Gas Co., which is a customer of Tennessee, holds that since the bulk of Industrial's sales are to International Nickel Co., Huntington, W. Va., domestic customers might be deprived of essential gas and other industrial customers would necessarily have to be curtailed if the plea is granted.

FPC Amendments

The FPC has made public proposed amendments to its General Rules, including its Rules of Practice and Procedure, which became effective Sept. 11, 1946. The proposed amendments have been sent to state regulatory commissions, utility companies, and other interested parties for comments before action is taken by the commission.

Rules covered by the amendments include those pertaining to organization, method of operation, and regulations pertaining to preliminary permits, licenses, intervenors, appearances, complaints, petitions, motions, extensions of time, computations of time and other procedural matters.

Since the Rules of Practice and Procedure became effective last September, the commission stated it had received a number of comments and suggestions for revisions of the rules from members of the commission staff, various practitioners before the commission, and other persons representing utilities, licensees and natural gas companies.

Copies of the proposed amendments may be obtained from the Publications Division, Washington, D. C.

Payne Furnace Co., Beverly Hills, Calif., has inaugurated a new two-way "ship-to-shore" radio telephone service which will enable the company's fleet of service trucks to maintain telephone contact with the plant's service department at all times. This system permits Payneheat's main office to relay service calls to the truck operator while he is enroute or on another job. The truck operator can originate calls by pushing a "talk" button which puts him in touch with a telephone company mobile service operator who connects him with the number called.

Cities Service Rates

The FPC has accepted schedules filed by Cities Service Gas Co. of Oklahoma City, Okla., effecting an annual reduction of approximately $4,452,527 (based on 1941 revenues) in rates and charges for natural gas sold in interstate commerce for resale for ultimate public consumption. The new rate schedules apply to all sales of gas at wholesale to customers in five states, except to certain deliveries under specified schedules to Consolidated Gas Utilities Corp., Eastern Kansas Gas Co., C. A. Leonard Oil and Gas Co., and Union Gas System, Inc.

The reduction is retroactive to Sept. 1, 1943. About $22 million collected by Cities Service during the period from Sept. 1, 1943, to April, 1947, has been impounded by order of the Circuit Court of Appeals for the Tenth Circuit.

FPC Budget

The Second Deficiency Appropriation Bill, 1947 (H.R. 3245) reported to the House of Representatives April 30 by Chairman Taber of the Committee on Appropriations, carries $354,000 appropriations for the Federal Power Commission—$42,800 less than the Budget estimate of $396,800. The FPC appropriations are designated as $330,000 for salaries and expenses, and $24,000 for flood control surveys.

A clause in the contract between the Key West (Fla.) Gas Co. and the city which specified a 5% discount to customers paying their bills by the tenth of the month was eliminated last

month by the city commission of Key West. The amendment was granted upon petition of the gas company, which revealed that it had been operating on a deficit since installation of a propane plant last year.

State Sen. Henry Baynard of St. Petersburg, Fla., has introduced a bill calling for creation of a Florida public service commission to supplant the present state railroad commission.

The proposed five-man commission would take over the powers of the railroad commission and, in addition, supervise privately owned gas and utility companies in the state. The bill calls for a division of the state by districts, with each of the five districts furnishing one commissioner.

FINANCIAL

Gas Sales

Trend continues in March with 21% gain over 1946.

March sales of the gas utility industry to ultimate consumers were 2927 million therms, equivalent to a gain of 21.2% over sales of 2414 million in the same month of 1946, the American Gas Association reported last month. All three branches of the industry showed significant gains, with the largest percentage advance being recorded by mixed gas sales, which increased 42.5%. Manufactured gas and natural gas sales gained, respectively, 21.0 and 19.9%. The association's March index of total gas utility sales is 220.2 (1935-1939 = 100).

Low Rate Record

San Francisco has the lowest utility rates among the nation's 25 largest cities, and Los Angeles ranks fourth, the California Public Utilities Commission reported last month.

In its annual report, the commission said the typical bill for gas, electricity and telephone in San Francisco was $6.89 a month. This compared with the typical New York bill of $15.38 a month.

The report said Californians had been saved approximately $8,000,000 in the last fiscal year through rate reductions, chiefly for gas and electricity.

Rate Dispute

The Greenfield Gas Co. has filed suit in the Hancock Circuit Court at Greenfield, Ind., to set aside a Public

Service Commission order cutting its rates for gas. The cut was ordered last July for gas sold in Greenfield at an estimated reduction of $5,200 annually to consumers.

The company claims that the petition for the rate hearing was obtained by solicitation and that the PSC failed to take proper account of the utility's valuation. The company further claimed that the reduction in rates would total more nearly $7,500 annually than the amount estimated by the commission. An early hearing was not expected.

Purchase Asked

The Gas Service Co., Kansas City, Mo., has asked the Missouri Public Service Commission and the Kansas Corporation Commission to permit it to purchase the Interstate Gas Co. and Interstate Pipe Line Co., Lee's Summit, Mo. Interstate serves a total of 9627 customers in 21 Missouri and 16 Kansas towns.

If the purchase is approved by the state bodies, permission will be sought from the Securities and Exchange Commission.

Welsbach Engineering and Management Corp. became The Welsbach Corp., effective May 1, 1947, as the result of a vote taken at the annual meeting of stockholders. Furthermore, all domestic wholly-owned subsidiaries have been merged with the parent company, The Welsbach Corp., as operating divisions. These subsidiaries are Kitson Co.; Ozone Processes, Inc.; Welsbach Street Lighting Co. of America; and American Street Lighting Co.

President Gardiner Symonds of Tennessee Gas & Transmission Co. has announced a company profit of $492,540 through operation of the Big and Little Inch pipe lines during the first three months of this year. Symonds said his company's total net income during the quarter was $1,499,925, or 67 cents per share of common stock.

When the FPC approved last September a new rate schedule filed by Mississippi River Fuel Corp., reducing its rates by $945,613 annually, it rejected a provision in the schedule in which the company sought the right to collect retroactively the rates which the commission had determined as unreasonable, in the event the commission's order was not sustained upon court appeal.

Late in April the commission withdrew the modification, permitting the clause to be filed with the supplemental rate schedule, but refused to express either approval or disapproval of it.

EMPLOYEE RELATIONS

Utility Strike

Indianapolis strike drags through second month.

A tug of war between CIO union organizers and the Citizens Gas & Coke Utility, Indianapolis, Ind., culminating in a called strike by union members at the start of the night shift April 2, will test the strength of the 1947 Indiana Compulsory Arbitration Act.

Regardless of the outcome of the strike, or its duration, which may be drawn out, the work stoppage brings to the fore the problem of maintaining service by a municipally-owned public utility when faced with labor complications.

The immediate cause of the strike call, as announced by the officials of the United Gas, Coke & Chemical Workers, CIO, was the alleged discharge by the utility of 17 employees, of whom 12 were var veterans, for union activities. The union claims "the issue now is job security rather than wages."

The Board of Directors of the utility maintain there is no dispute with its employees, whose representatives signed an agreement in March in which they received an increase of 15% in wages. The employee representative plan was installed Feb. 18, 1936, under which approximately each 50 employees elect one of their own members as a representative. These representatives meet once a month for the purpose of discussing safety, job classification, working conditions, and wages. Currently, the lowest weekly pay check at the Prospect and Langsdale plants for common labor is $47.04; at the Distribution plant, $43.12. Most of the jobs earn more than this base average wage.

The utility's payroll carries approximately 750 maintenance and production employees. Of these, about 275 are at the Prospect plant, and 175 at the Langsdale plant, where the men started the strike. The West Ninth Street plant was not immediately affected by the initial work stoppage.

Arthur F. Miltner, international union representative of the United Gas,

MORE THAN 20,000,000

. . . and this is just one of the hard-working ads in Gas Refrigeration's greatest advertising campaign in history

During the months when refrigerator buying reaches its peak, full-color ads like the one shown here will appear in eleven of America's best-read home magazines. Again and again, Gas Refrigeration's exclusive selling story of silent operation, no moving parts, and longer wear will be told to the families that make up the backbone of the buying public. And these ads will have a high repeat readership—from both men and women—because the publications selected remain on the family's magazine table for a long time.

Now's your big chance to cash in on the success of Gas Refrigeration's national campaign with local promotion of your own! Large reprints of these ads are yours for the asking. Make them work for you. Let them help you tell refrigerator prospects in your community that *you* sell the Servel Gas Refrigerator—the refrigerator that stays silent, lasts longer.

Servel GAS REFRIGERATOR

EVANSVILLE 20, INDIANA

FAMILIES WILL READ THIS AD IN JULY!

CHECK FOR YOURSELF... ONLY SERVEL FREEZES WITH
No Noise! No Wear!
IMAGINE a modern automatic refrigerator that freezes with no moving parts at all! No machinery, valves, pistons or pumps to cause noise or wear! It's a wonderfully different, simpler refrigerator—the famous Servel Gas Refrigerator!
Two million families enjoy Servels today—some have had 'em 20 years!... Ask any of them. They'll tell you—"Pick Servel. It stays silent, lasts longer."
New and finer for 1947, the famous Servel Gas Refrigerator brings you every new food-storage convenience, too. See what a beauty it is! How its extra roominess cuts out your marketing trips! For frozen foods, for fresh foods, you'll find your best refrigerator investment is a permanently silent, longer-lasting Servel Gas Refrigerator.
Look . . . New Conveniences!
✓ Big Frozen Food Compartment
✓ Plenty of ice cubes in trigger-release trays
✓ Moist cold and dry cold
✓ Convenient Servel meat storage tray
✓ Two dew-action vegetable freshener
✓ Plenty of tall bottle space
✓ Convenient egg-holder
✓ Clear-across shelves for extra roominess
✓ Shelves adjustable to eleven different positions
✓ Plastic Coated shelves (for easy-cleaning, stay rust-free, scratch-free)
plus
✓ No moving parts in freezing system to wear or need repair
✓ Permanent silence
BIG FROZEN FOOD LOCKER
MOIST COLD, DRY COLD
NO NOISE, NO WEAR
STAYS SILENT . . . LASTS LONGER
Servel
The GAS Refrigerator
Your Gas Company and neighborhood dealer
GOOD HOUSEKEEPING

Coke & Chemical Workers, claims a membership of "almost 400 of the approximately 450 maintenance and production men employed at the two struck plants." The utility directors contend that only a very small minority belong to the union, and have consistently refused to hold an election.

As the strike continued into May without any sign of immediate settlement, charges of mismanagement of the utility were made by the union and re-echoed in the city council, where consideration is being given to the possibility of bringing the entire case before the Circuit Court for a showdown on the authority of the present management of the public utility to continue the strike. Other points at issue between the utility management and the city council over jurisdictional authority in management of its operations, include lower consumer rates and the mixing of natural and manufactured gas in the utility's mains.

In the meantime the utility management claims complete consumer service is being maintained in spite of the strike. The utility obtained a court order banning mass picketing.

Indoctrination

With 54 office employees in attendance, Houston Natural Gas Corp. held a two-week's indoctrination course in April. For one hour each day, "students," all of whom are employees added to Houston's force during the previous 12-month period, learned about current sales activities, new household appliances, fundamentals of gas operations, and bases of customer contacts.

The classes made use of six sound slide films which are included in the AGA personnel training portfolio. Presentations centered around three themes: "Gas the Fuel," "Gas the Service," and "Building the Gas Load."

Carl Fuess, assistant in the personnel department, was in charge of the school.

Pension Refund

Southern Counties Gas Co., Los Angeles, has worked out with Metropolitan Life Insurance Co. of New York a plan whereby employee contributions to the company's pension fund are being refunded, and a new Uniform Pension and Benefit Plan will go into effect. Employees on disability were the first to receive their refunds, and active employees will get theirs in the order of the insurance certificates. Under the new plan, the retirement age for women will be changed from 55 to 60 years. Refunding started May 1.

Gas Behaves at Texas City

Heroic action by Houston Natural employees prevents gas fires and minimizes losses; service restored in five hours.

Gas service to residents of Texas City, Texas, was interrupted for only five hours on April 16 when that explosion-torn, fire-razed community became the scene of one of the nation's greatest tragedies.

District office headquarters are maintained by Houston Natural Gas Corp. at Texas City. The district ranks third in number of customers served, among the 16 districts which make up the system outside of metropolitan Houston.

Immediately following the first terrific blast at 9:12 o'clock on the morning of the explosion, gas was turned off at the main gate at the Texas City city limits. The first indication to reach the Houston office that anything was wrong came when the remote control metameter chart reflected an absolute drop in pressure. Minutes later came a communication that the Monsanto Chemical Co. had blown up.

Vice President E. S. George and Division Superintendent J. N. Young immediately ordered service and main line crews to the scene of the disaster. Two fully-manned service trucks took off at once on the 50-mile trek from Houston, with two other service trucks starting out at the same time from the company's Tri-Cities office, 32 miles away. Main line crews also were dispatched, and additional company men reported from four districts, bringing the number of Houston Natural emergency workers to approximately 60.

Young's initial step upon arriving in Texas City, after learning from District Manager J. S. Sullivan that all local employees were safe (none of the men was injured, nor was any member of their families), was to make a bee-line for the company regulator feeding station off the Monsanto line. With the heart of the blazing inferno only two blocks distant, he cut this station off completely.

The next move was to map off the entire town by sections, and to assign crews to cover each section. Every home was visited in this systematic manner and in each instance the meter was turned off at the riser. In one section near the Monsanto plant, the crews were forbidden to enter at the outset because of poisonous gases. After waiting an hour or so, however, the men proceeded to turn off the gas at 250 wrecked homes in this devastated area. All told, the gas was turned off at 3150 residences in two hours.

Shortly after noon, with fuel badly needed to meet the urgent demands of hospitals, cafes, morgues and emergency stations, the company began feeding gas back into its lines until its system was packed to the required pressure with gauges indicating no leaks.

Service crews were reorganized and sent back over the same residential area to turn the gas back on. As less than 15% of the homes were occupied at this time due to the city-wide evacuation, turn-ons were few. Each day thereafter, with gas company trucks constantly patrolling the city, additional turn-ons were made until—one week later—gas service had been restored to 90% of the residences which were not either condemned as unfit for living or totally destroyed. It is estimated that Houston Natural will lose some 400 accounts in damaged buildings which will not be rebuilt for habitation.

Although huge pieces of flying steel plowed tremendous holes in the ground over a radius of several miles, only one 1¼-in. service line was broken. The greatest equipment loss to the company, and that relatively small, will result from broken meters caused by concussion.

After the disaster, a representative of the company's personnel department contacted each employee, determining his individual welfare and offering housing and financial assistance as needed.

Representatives of the company's utilization department checked all air conditioning installations prior to the time the gas was turned back on, rewrapping some of the ducts and adjusting controls. A major responsibility still confronts the company in the adjustment of other automatic gas household appliances.

The company regulator house near the Monsanto plant was completely destroyed, but the inside equipment remained intact with the exception of one small gauge connection which was severed by flying debris.

None of the countless raging fires was attributed to natural gas.

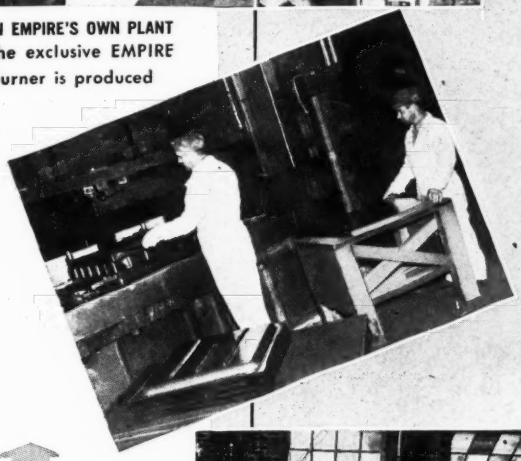
The United Gas Corp. of Houston and the Texas Public Service Co. of Galveston, two privately-owned gas utility companies, called in the early stages of the disaster to offer their assistance both in manpower and equipment, but were not needed.

IN EMPIRE'S OWN PLANT the exclusive EMPIRE Burner is produced

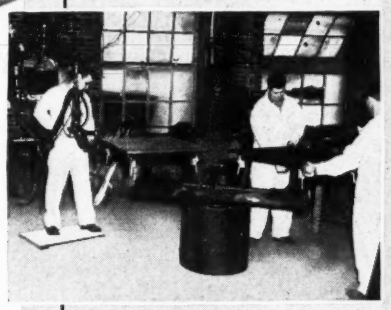
BUILD GREATER

Customer Satisfaction on

EMPIRE



IN EMPIRE'S OWN PLANT huge presses form accurate steel stampings

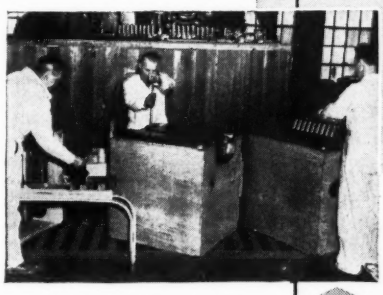


IN EMPIRE'S OWN PLANT floor registers are built

UNIFIED PRODUCTION

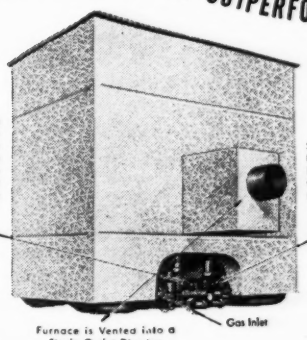
Customers derive more pleasure, more home comfort, and more satisfaction in owning an EMPIRE Gas Heating Appliance. This is assured because of EMPIRE superior engineering and UNIFIED production.

Unified production means that 95% of all integral parts are produced in the EMPIRE plant... an achievement not found elsewhere in the Industry... and that a definite control over materials, methods, and fabrication assures uniformity of quality.



IN EMPIRE'S OWN PLANT Mass Production Assembly Lines keep costs low

DEPEND ON EMPIRE—THE GAS FLOOR FURNACE THAT OUTPERFORMS ALL OTHERS


It Is Now a Simple Task to Convert an EMPIRE Floor Furnace to Thermostatic Operation. Simply Remove Union Connections and Pipe Installed in Furnace, Insert Solenoid Valve Between Unions and Replace.
Solenoid Valve, Burner, Pilot Control and All Gas Lines Are Recessed in Casing and Bottom Areas to Afford Complete Protection of All These Parts.
Furnace is Vented into a Single Outlet Diverter
Gas Inlet

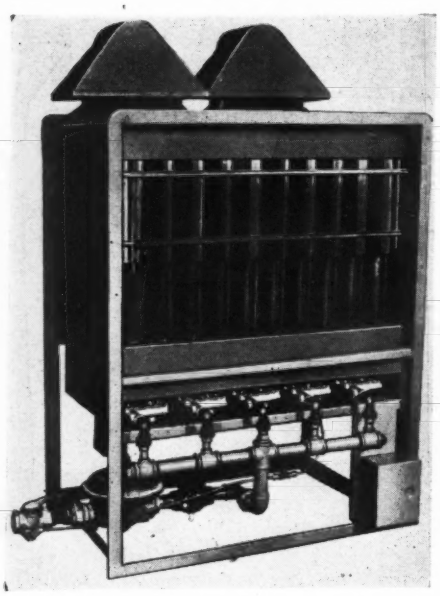
EMPIRE STOVE CO.

BELLEVILLE, ILLINOIS

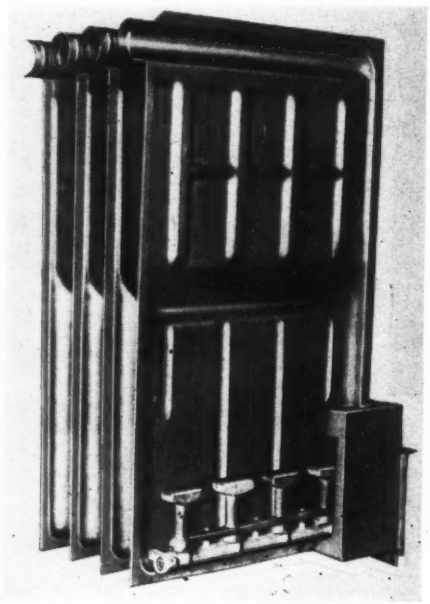
MANUFACTURERS OF GAS HEATING AND COOKING APPLIANCES

SALES POINTERS

Pacific Duct Furnace



The new furnace is easily installed, designed to permit air travel in either direction. In installation, air deflector assembly is reversible.



Heating element, with nearest section halved to show interior arrangement. Design eliminates need for rust-susceptible interior baffles.

Manufacturer: Naco Manufacturing Co., Pacific Heater Division, Box 310, Huntington Park, Calif.

IN the recently announced Pacific Duct Furnace, an innovation which the manufacturers term "Duo-Stage Temperature Modulation" is applied to an established type of gas furnace. By automatic selection from either of two stages of discharge air temperature, Duo-Stage permits maintenance of constant room temperature without diminishing either warm air circulation or fresh air ventilation.

This modulation is accomplished by thermostatically controlled cutoff of gas to individual sections of the furnace, while remaining sections continue to operate at their full gas input rate. Whether low or high temperature air is desired, continuous full-speed blower performance is maintained.

When the selected temperature within the area being serviced is reached through full performance of the furnace, Duo-Stage Temperature Modulation automatically reduces total heat delivery, with undiminished air delivery. Temperature fluctuation and lag are reduced, while ventilation and air circulation are sustained.

The furnace is recommended for forced air heating and ventilating in all types of structures. The manufacturer suggests it as a practical answer to the heating problems in schools, stores, churches, halls, theaters, and large residences. Some of the outstanding features claimed for the furnace are these:

1. *Scientific design.* Eliminates the need for rust-vulnerable baffles through shaping and embossing of the elements. Complete heat pattern and full heat absorption are assured, while the shaping and embossing strengthen the sections, eliminating need for inner support.
2. *Flexibility.* Standard model offers delivery ranges from 50° to 100° temperature rise air. With Duo-Stage Temperature Modulation, an additional range from 30° to 50° temperature rise air becomes available.
3. *Noiseless operation.* No popping.
4. *Pacific Multi-tubular burner.* An improved manifold hook-up insures automatic air adjustment and complete combustion. All burners are easily accessible for servicing. Each burner assembly is engineered at factory for proper type of gas.
5. *Ease of installation.* Designed to permit air travel in either direction by reversing air deflector assembly. All controls are installed and wired at factory to junction block. May be installed singly or as a battery in basements, lower or upper floors, suspended from ceilings, in attics, or on roofs.
6. *Compact, low height.* Can be extended where desired.
7. *Hangers.* Available optionally.

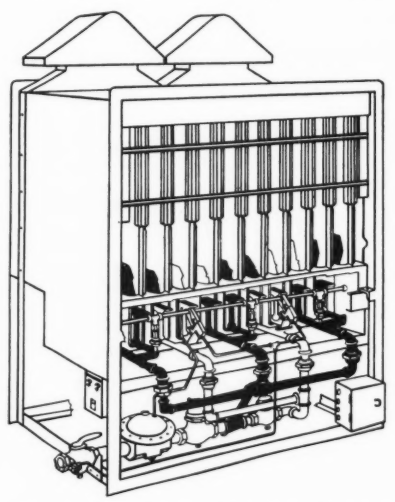


Diagram showing Pacific's Duo-Stage Temperature Modulation in action. In this case, separate gas manifold (low stage) services Sec. 1-2, 5-6, 9-10; companion manifold services Sec. 3-4 and 7-8. At full input both manifolds and all sections are in operation; one manifold operates at low stage.

8. *AGA-approved.* Five capacities of the furnace, ranging in size from 90,000 Btu input per hour to 450,000, carry association's seal.

Catalog No.	*B.T.U. Input/hr.	Air Thruput C.F.M.		DIMENSIONS				Vent Stack req. Sq. In.	Gas Pipe Sizes		Approx. Shipping Wt. Crated
		Max.	Min.	O.H.	D.	W.	H.		Nat.	Mfg.	
13PDF-90	90,000	1600	660	67	28	12¾	29	19	½"	¾"	270
13PDF-150	150,000	2000	1100	67	28	20	29	28	¾"	1"	350
13PDF-210	210,000	3000	1600	68	28	27¼	29	38	1"	1¼"	450
13PDF-300	300,000	4850	2200	67	28	38¼	29	56	1¼"	1¼"	625
13PDF-450	450,000	7200	3400	68	28	56¼	29	84	1¼"	1½"	950

SPECIFICATIONS. (*Btu output/hr. 80% of rated input.)

Catalog No.	HIGH STAGE						LOW STAGE	
	100°	90°	80°	70°	60°	50°		
13PDF-90	660	730	820	940	1100	1320	Available in high stage only	
13PDF-150	1100	1220	1370	1570	1830	2200	Available in high stage only	
13PDF-210	1600	1710	1920	2200	2560	3080	57.2%	C. F. M. selected for high stage remains constant. Degree of temperature rise for low stage is determined by multiplying selected high stage temperature rise by percent indicated in panel.
13PDF-300	2200	2440	2740	3140	3660	4400	60.0%	
13PDF-450	3400	3660	4110	4710	5490	6600	53.3%	

AIR DELIVERIES IN CFM AT SPECIFIED DEG. TEMP. RISE

Sell the water heater that provides "Packaged-in-Glass" Hot Water

No Rusting! No Corroding! Under *any* water condition, the all-modern *Permaglas* Water Heater CANNOT rust or corrode! It's ever ready with all the hot water needed, for even the newest homes, pure and clean as the source itself.

Permaglas

TRADE MARK REG. U. S. PAT. OFF.

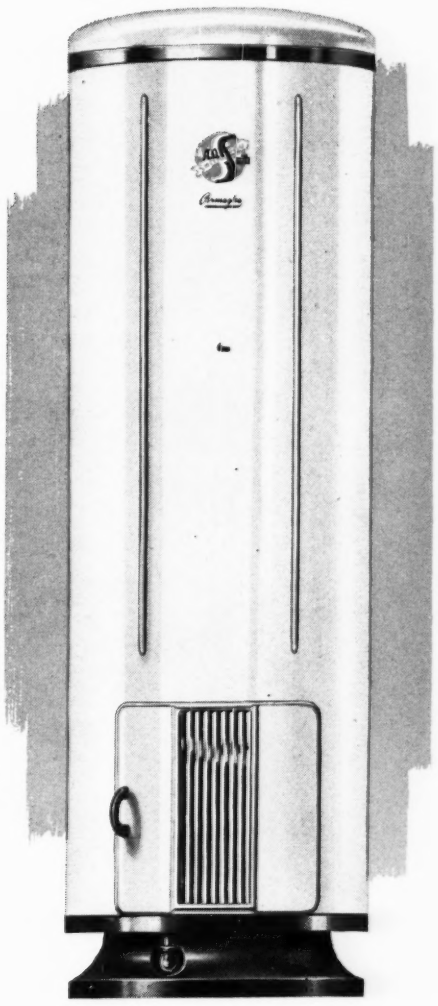
SMITHway WATER HEATER

The *Permaglas* Water Heater has the tank of glass-fused-to-steel—mirror-smooth and sparkling blue. Rust that ruins clean laundry . . . and corrosion dirt that stains both water and porcelain . . . *are banished.*

There's Only ONE "*Permaglas*"—a Great Aid to Sales

Only A. O. Smith offers you the automatic water heater that's *news.* The "*Permaglas*" sales story is the newest and most dramatic in the appliance business. Get all the facts now on this new discovery about hot water.

Write the nearest A.O. Smith office for "The Inside Story of Permaglas."



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HOT WATER "Packaged-in-Glass"

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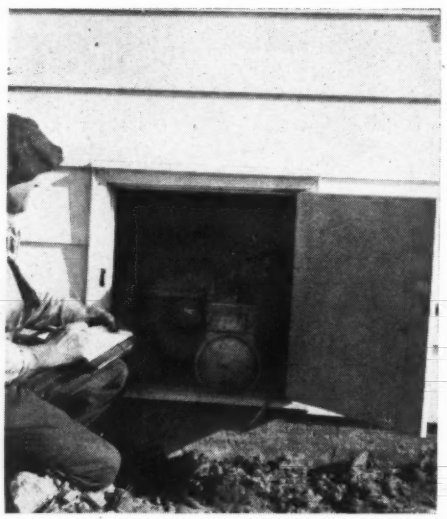
New York 17 • Atlanta 3 • Chicago 4 • Houston 2 • Seattle 1
Los Angeles 14 • International Division: Milwaukee 1
Licensee in Canada: John Inglis Co., Limited

OPERATING IDEAS

Recessed Meter Box Solves Problems for Denver Utility



SUBMITTED by Joseph W. Miller, editor, "Lines," Public Service Co. of Colorado, Denver, Colo.

With the trend toward building small homes without basements, location of gas meters has become a problem. As a solution, a Denver contractor offers a meter box which is recessed into the rear wall of the residence above the foundation, with a door opening to the outside. Inside the home the meter box forms a shelf in a closet, with no opening into it from the inside. The meter reader does not have to enter the home, eliminating skips and reducing time required. Maintenance and repair work are done from the outside, and the meter and regulator are not subjected to freezing temperatures nor blocked by snow.

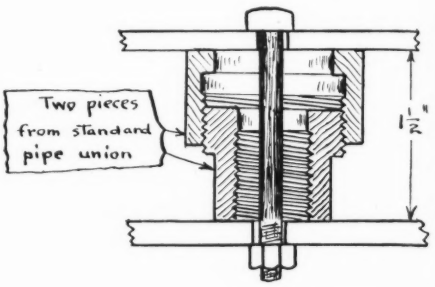
The gas service pipe should be brought up from the bottom of the compartment, and clearance of about 4 in. from the two sides should be allowed to make the proper connection.

The new meter box is being used by Public Service Co. of Colorado. According to R. L. Davis, superintendent of the gas customers shop, the box is "the answer to our problems."

Adjustable Shim Made From Old Pipe Union

SUBMITTED by W. F. Schaphorst, M.E., 45 Academy St., Newark, N. J.

The accompanying sketch shows how parts of an old pipe union can be used as a shim or block while bolting some steel shelving onto a wall where there is a gap to be maintained rigidly. The threads give a union the desired ad-



justable feature with a variation range of about ½ in. This is substantial, looks good, and is not a temporary makeshift job. Large unions may be used as well as small, depending upon the fixed distance desired. Where distances to be held are greater than the length of a union, a nipple and coupling can be used in the same way.

CLEVELANDS

Proved on Thousands of Trenching Jobs...

LONG AND SHORT... TOUGH AND NORMAL

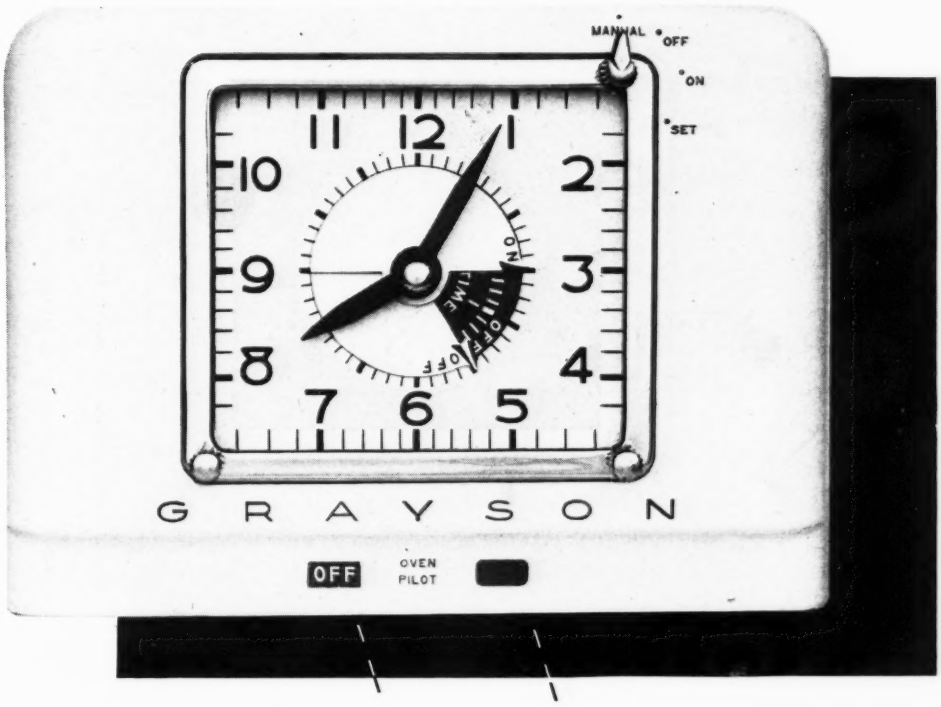
PAY OFF EVERY TIME — BECAUSE OF THEIR MANY EXCLUSIVE PIONEERED FEATURES THAT ASSURE • SPEED • MOBILITY • FLEXIBILITY AND DEPENDABILITY

Some of the many special pioneered features that have contributed to unsurpassed performance records in all sorts of soil and over all kinds of terrain are:—compact full crawler mounted wheel type design—elimination of all excess weight—transmission controlled speed changes and speed combinations—equalized drive to the digging wheel through enclosed differential—ease of operation through simplified, easy lever control and full operator vision—unit type construction minimizing repair time—trailer mobility.

THE CLEVELAND TRENCHER CO.
20100 ST. CLAIR AVENUE • CLEVELAND 17, OHIO

New Clock Control Safety Valve

SIMPLIFIES OPERATION



CONTROLS BY GRAYSON
CLOCK MECHANISM BY LUX

ACCESSIBLE RESET BUTTON

VALVE POSITION VISIBLY INDICATED

GRAYSON CONTROLS

DIVISION ROBERTSHAW THERMOSTAT CO.
LYNWOOD, CALIFORNIA

PEOPLE

W. L. Melcher
. . . A. O. Smith

D. D. Buttolph
. . . Phillips

G. H. Langsdorf
. . . Oronite

J. A. Wilson
. . . United Gas

JAMES A. WILSON is the new manager of the Houston division of United Gas Corp., succeeding W. B. HEAD, JR., who resigned to enter business for himself. Wilson entered the utility field in 1930 as an industrial and commercial salesman for the Houston Gas and Fuel Co. In 1932 he transferred to industrial salesman for United Gas Public Service Co., predecessor of the present United Gas system. Other promotions were to district manager at Liberty, sales manager at Beaumont, industrial sales manager at Houston for the entire operating division of United Gas Corp., manager at Longview and Monroe, La., and since January, 1946, assistant manager of the Houston division.

WILLIAM L. MELCHER, product service supervisor at the Milwaukee headquarters of the A. O. Smith Corp., has been transferred to New Orleans where he will be in charge of the company's water heater and conversion burner sales in the states of Louisiana and Arkansas. This area is controlled by the company's district office at Houston, Texas. Melcher joined A. O. Smith in 1943, after having engaged in public utility appliance sales work for a number of years in Illinois and Wisconsin.

GAYNOR H. LANGSDORF has been named a vice president and director of Oronite Chemical Co., in charge of products and processes. Langsdorf has been manager of technical services in the manufacturing department of the Standard Oil Co. of Calif., Oronite's parent company. NORMAN N. GAY, previously manager of Oronite's product development division, has been transferred to Standard's special products division.

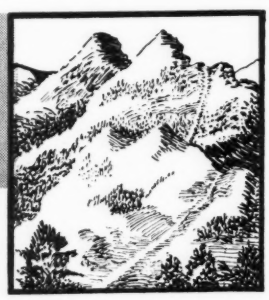
DOYLE D. BUTTOLPH was recently appointed manager of the mechanical equipment division, Phillips Petroleum Co., Bartlesville, Okla. Buttolph joined Phillips in 1940 as a senior draftsman, became acting district manager of the tank car division in Bartlesville, and was transferred to the engineering department. He served in the army for nearly four years and recently returned to Phillips as assistant manager of the engineering and equipment division.

F. J. Hoenigmann

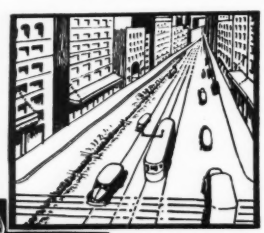
FRANK J. HOENIGMANN has resigned as executive vice president and director of Florence Stove Co., Gardner, Mass., according to an announcement by President Robert L. Fowler. Hoenigmann, who has maintained headquarters in the Chicago office, has been in charge of Florence operations. He is leaving the company on June 30, and his future plans will be announced later.

LEO H. EAST, former superintendent of gas distribution for the Rochester Gas & Electric Corp., has been promoted to general superintendent of the

OVER MOUNTAINS
IN CONGESTED AREAS
THROUGH SWAMPS



HILL, HUBBELL
PIPE PROTECTION
FITS YOUR REQUIREMENTS



FACTORY APPLIED TO
YOUR SPECIFICATION

Your transmission and distribution lines are buried in soils of varying corrosive potentials.

Pipe in corrosive soils require engineered protection.

HILL, HUBBELL'S modern factory applied coating-and-wrapping is widely accepted by leading engineers, because of our exacting application of all specifications.

Hill, Hubbell and Company
Division of GENERAL PAINT CORPORATION
3091 MAYFIELD RD. CLEVELAND, OHIO.

POSITION WANTED!

ALERT YOUNG MAN with sure fire sales appeal would like position with aggressive Appliance Dept.

Mr. Appliance Merchandiser
U. S. A.

Dear Sir:

We heartily recommend this full round Magic Chef figure for a place in your store. He stands 28" high, is lifelike in color and form. This figure points to a sales message on an 8½ x 11 card which fits in his right hand. Three cards come with the figure and each has a message which suits your retail needs. He can also be used to hold a message of your choosing, calling attention to merchandise in your window or other departments of your store.

Very truly yours,
MAGIC CHEF

FOR EASIER BETTER COOKING

FULL ROUND PLASTIC FIGURE
28" HIGH • ORDER BY NO. L-925

For details on this figure and dozens of other sales helps — contact your nearest Magic Chef Sales Representative, American Stove Company, New York; Philadelphia; San Francisco; Chicago; Cleveland; Atlanta; St. Louis.

gas division and supervisor of the coke and transportation departments. RICHARD E. KRUGER, former superintendent of gas production, was promoted to superintendent of gas operations, including manufacturing, distribution and research.

T. S. BACON, chief engineer, Lone Star Gas Co., Dallas, Texas, has announced the following personnel changes in the engineering department: C. O. DILLER has been relieved of duties as chief draftsman to permit him to devote full time to duties as superintendent of the electrical department, and D. W. BRIGHT has been promoted from assistant chief draftsman to chief draftsman. An engineering development staff has been added to the department. J. L. THOMPSON, research engineer, will supervise this staff, which is comprised of F. K. ZAPFFE and D. H. BROWN, control engineers; I. J. KAIM, chemist; F. A. HUNOLD, engineer, and J. F. ROBERSON, junior chemist.

LOUIS B. HULCY, who has been local manager at Grand Prairie, is new manager of Lone Star's Arlington district of distribution in the Forth Worth division. J. B. HOUSTON, who has been manager at Handley, is now local manager at Arlington, since Handley has been annexed to the city of Fort Worth.

ARCCO
The World Over
—wherever there is gas
ARCCO-ANUBIS
GAS
GRAVITOMETERS
• Once calibrated and properly installed the Arcco-Anubis Gas Gravitometer requires no further attention. Hundreds are in use in pipelines and refineries of major companies. • This precision specific gravity instrument is constructed without electric motors, pressure regulating valves or other complex arrangements. The instrument is practically frictionless and the gas flows through it continuously, thus minute changes in specific gravity are recorded at once as they occur. As shown through years of use, Arcco-Anubis Gas Gravitometers remain accurate and highly responsive even under severe conditions of service.
Send for Bulletin No. 101
AMERICAN
RECORDING CHART CO.
913 E. 11th St. • Los Angeles 23, Calif.
Available for Early Delivery
SEND FOR BULLETIN NO. 101

Dean H. Mitchell

DEAN H. MITCHELL, president, Northern Indiana Public Service Co., Hammond, Ind., has been elected a director of the U. S. Chamber of Commerce, representing District Five which comprises Michigan, Ohio, Indiana and Kentucky. Mitchell is a director of the Indiana State Chamber of Commerce and formerly served two terms as president of that group. He is a director and past president of the Indiana Electric Association and also the Indiana Gas Association.

EDWARD S. BUDD, assistant secretary of The Cooper-Bessemer Corp., Mount Vernon, Ohio, recently became manager of the company's parts division. Budd has served the firm for 22 years. J. F. STEVENSON has succeeded M. A. WINLAND, who died recently, as assistant works manager of the Grove City, Iowa, plant. Stevenson was formerly production manager of that plant. Other recent Grove City promotions include W. A. LULI, who was named production manager; R. H. BRAGG, assistant production manager; H. K. STEVENSON, general superintendent, and W. W. RICHARDS, chief planner.

KENNETH W. STOOKEY, who has been with The Gas Machinery Corp., Cleveland, Ohio, for the past 18 years, was elected president of the firm at the annual meeting of the board of directors. WILLIAM E. STEINWEDELL, president since 1928 and one of the founders of the company in 1902, is the new chairman of the board. JOSEPH C. CALHOUN, JR., was elected secretary in addition to his position as vice president.

EDWARD D. JACKSON has been appointed sales manager for The Coroaire Heater Corp. and its subsidiary, Hot Boy, Inc. He will direct national sales of Coroaire gas-fired heating and winter air-conditioning units and Hot Boy space heaters through 300 distributors and jobbers and 20,000 dealers. A graduate of Yale University, he has had wide experience in sales and engineering.

L. A. HAMILTON, EMMETT W. MacCORKLE, and HERMAN VAN FLEET, JR., have been named district managers for Air Reduction Sales Co., New York. Their districts are Seattle, Portland, Ore., and New England, respectively. In addition to his sales function, Van Fleet will be in charge of Air Reduction plants at Boston, South Portland, Maine, and Central Falls, R. I.

H. CLIFF CORWIN has been named sales manager of White Engineering & Mfg. Co., Inc., Rochelle Park, N. J. Corwin, who was formerly assistant sales manager of Manley Division, American Chain Co., York, Pa., will supervise the setting up of distribution channels for White steam cleaners.

ARCHITECT USES SIX PANELRAYS IN OWN HOME

Home of
Howard E. Jones,
Architect of
San Bernardino, Calif.

Living room of the
Jones home showing
Panelray installation.

DAY & NIGHT

DAY & NIGHT MANUFACTURING COMPANY

Monrovia, California • One of the Dresser Industries

HENRY C. L. JOHNSON is Rheem Manufacturing Co.'s new advertising manager. For the past 10 years, except while serving in the navy, he has been with Sylvania Electric Products, Inc. Johnson will make his headquarters in Rheem's New York office. CARLTON A. JOHANSON, who has been manager of public relations and advertising for Rheem, is resigning to open a public relations and consulting office in San Francisco.

PHIL D. BERTHOLF has been selected by Bryant Heater Co. as manager of a new Cleveland branch office which will handle distribution of Bryant products for the Northeastern Ohio area. Bertholf has been in the main Bryant plant in Cleveland since 1945 where he has directed allocations of manufactured products to the firm's distributors. He joined the company in 1937. ROBERT T. KILLIAN, formerly with the Westinghouse Electric Corp., is Bryant's new manager of market development and research. Killian will study the expanding demand for gas heating so that production may be geared to meet market requirements, and he will make a number of special market studies.

SAMUEL J. LEVINE has been named managing engineer of General Electric's Automatic Heating Division in Bloomfield, N. J. He will be responsible for both engineering and manufacture of all General Electric automatic heating equipment. Recognized as one of the country's leading technicians in gas boiler and furnace design, Levine has been an active member of the A.G.A. Technical Advisory Group for Central Gas Space Heating Research of the Committee on Domestic Gas Research. He is a specialist in problems of heat transfer and is Project Sponsor for a current association project being carried on at the A.G.A. Testing Laboratories.

JOHN PAUL JONES, Marion, Ohio, has been appointed chief engineer at Bendix Home Appliances, Inc., South Bend, Ind., according to W. F. OLIVER, vice president and director of engineering, who had held the post in connection with his administrative duties since the war. Jones joined Bendix after more than six years with various subsidiaries of the International Detrola Corp.

DENNIS F. McCARTHY has been named manager of the new Tubular Goods Division of the A. O. Smith Corp., Milwaukee, Wis., a division which handles the manufacture and sale of steel pipe for oil and natural gas lines and oil well casing. McCarthy has been in the sales department of the company for 11 years and has been associated with the sale of tubular goods since 1938.

ALEC M. CROWELL has resigned as director of the production branch of the Interior Department's Oil & Gas Division to join the newly formed Texas Eastern Transmission Corp., successful bidder for the Big and Little Big Inch pipe lines. Crowell will be in charge of supplies, and the firm reportedly will establish headquarters in Shreveport.

F. N. WOLF has been appointed manager, planning and development department, Equitable and Pittsburgh and West Virginia Gas Co.'s, according to D. P. Hartson, vice president and general manager. Wolf will supervise department operations and will be responsible for the compilation and review of construction and operating budgets and other company statistics.

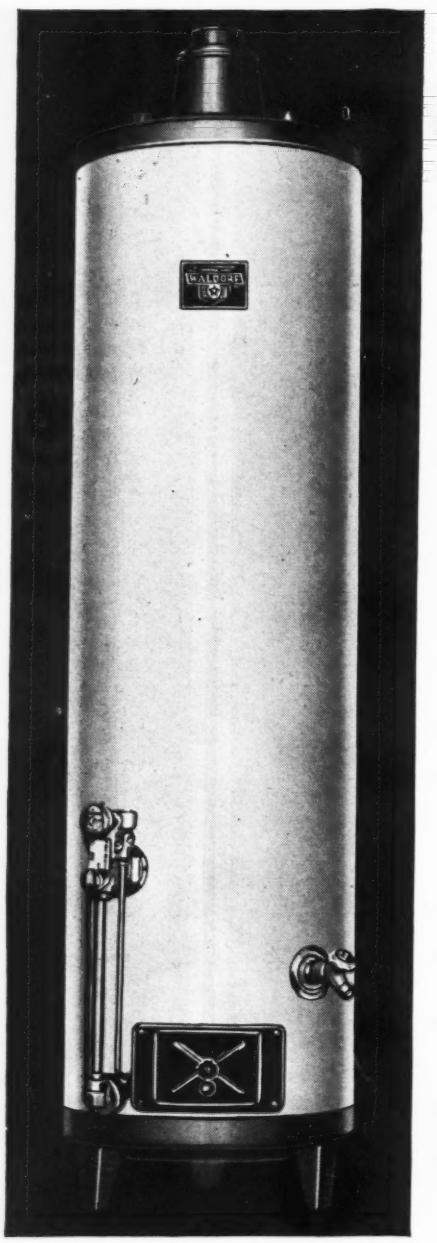
W. E. CURRAN has been named general manager of Rheem Manufacturing Co., according to R. S. Rheem, president. Joining Rheem in 1942, Curran was made vice president in charge of production in 1943, and in February, 1946, was elected a director. He will continue to make his headquarters in New York.

ROY C. JOHNSON has been appointed sales representative in Northern California for Cribben and Sexton Co., Chicago. He will operate under the supervision of Charles R. Woodson, Pacific division manager. Johnson has spent 20 years in the Pacific Coast gas range industry, covering both the retail and wholesale field.

MISS MARGARET B. DOUGHTY, home economist and educator, has been appointed director of Bendix Home Laundry Institute, South Bend, Ind., succeeding Miss Edwina Nolan, who retired. Miss Doughty recently served as head of the household equipment department in the college of home economics, Washington State College.

Attention, Utilities!

YOU CAN NOW PROMISE



IMMEDIATE DELIVERY

of the 1947

WALDORF

AUTOMATIC GAS WATER HEATER

Streamlined production has speeded our ability to deliver—will speed yours. In Waldorf you have one of the best-engineered-and-made water heaters in the field.

QUALITY FEATURES

- ***Positive, snap-action thermostat*** **with graduated dial for water temperature.**
- ***Electro-magnetic automatic*** **— 100% safety—thermo-couple control shuts off completely both pilot and main burner in case of gas failure. Gas will not flow to main burner until safety pilot is lighted and operating.**
- ***Insulated*** **with heavy blanket of heat-retaining fiber-glass.**
- ***Improved bunsen-type cast iron burner*** **designed and engineered for maximum efficiency.**
- ***Extra heavy precision welded tank,*** **galvanized inside and outside by hot-dip process. Pressure tested to 300 pounds.**
- ***Gleamingwhite, enamelled steel jacket,*** **baked by infra-red process.**
- ***Approved by American Gas Association.***

WALDORF HEATER CO.
1421 Chestnut St. • Phila. 2, Pa.

AUTOMATICALLY YOURS!

ROPER

In the days [illegible] more than ever the multiple advantages of selling [illegible] gas ranges, having established customer appeal. That's why you'll like the distinctive new ROPER line. With irresistible beauty of contour . . . with automatic time-saving, effort-saving features . . . with Jewels of Cooking Performance, these ranges are mighty substantial to tie to in looking at tomorrow.

Jewels of cooking performance

- "STAGGERED" COOKING TOP
- "SIMMER-SPEED" BURNERS
- LARGE "3-in-1" OVEN
- "SCIENTIFIC" COOKING CHARTS
- "GLO" BROILER
- "INSTA-FLAME" TOP LIGHTER

GEO. D. ROPER CORPORATION • ROCKFORD, ILLINOIS

Offices And Warehouses In Principal Distribution Centers

OTIS F. GOOD has been promoted to gas meter supervisor, Consumers Power Co., Jackson, Mich., replacing ARTHUR H. BELL, who will now devote all his time to supervision of the company's seven major gas meter shops. Good joined Consumers as a meter helper in 1929, and Bell soon will complete 40 years in gas meter work for Consumers and other companies.

C. H. HOBBS & ASSOCIATES of Pasadena, Calif., have been appointed exclusive sales agents in the 11 western states for Haylo heaters, which are manufactured by McCulloch Motors Corp., Los Angeles. McCulloch has established a new Heater Division for the production of Haylo heaters in two sizes at the rate of 1000 a day.

PHILIP THORNTON DASHIELL, former vice president of The Philadelphia Gas Works Co., is now associated with United Engineers & Constructors, Inc., as consultant on synthesis and city gas processes. Dashiell, who joined Philadelphia Gas Works in 1899 as a cadet engineer, has been active in development of production processes in the manufactured gas industry and is primarily responsible for the U.G.I. heavy oil process. He has received the AGA Beal Medal and the Walton Clark Medal given by the Franklin Institute of Philadelphia.

BRIG. GEN. HUGH C. MINTON will become production manager of Koppers Co., Inc., on July 1. He will report directly to General Brehon Somervell, president, and will be responsible for efficiency of manufacturing operations, advice and consultation on manufacturing methods, factory and shop management, and plant development and expansion.

MISS HELEN McCULLY, who for the past several years has been food copywriter for Kenyon & Eckhardt, has been appointed food editor of "McCall's Magazine" by Otis Wiese, editor-in-chief. Associated with Miss McCully in the food department is MISS MILDRED INWOOD and a staff of graduate home economists.

RUDOLPH E. REIMER, secretary and treasurer of Dresser Industries, Inc., Cleveland, Ohio, is now a vice president of the company. He has been associated with Dresser interests since 1929 and is an officer and director in many of the organization's units.

EDWARD C. LAMLEIN, 53, president of the Gas and Electric Corp. of Detroit, died on April 6. After serving in the army during World War I, he entered the sales and promotion department of Frigidaire, and between then and 1938 was also engaged in insurance, real estate and the manufacture of cosmetics. In 1938 Lamlein organized the Gas Equipment Co., Inc., as president, with his wife as secretary and treasurer. This corporation was dissolved in March, 1943, but the business continued as a partnership between the Lamleins until the formation of the Gas and Electric Corp. Since 1937 Lamlein has represented the Roberts-Gordon Appliance Corp. in Michigan, and he was secretary and treasurer of Siegel-Lamlein, Inc., a holding company chartered in 1936.

LESTER S. READY, of Berkeley, Calif., died April 9 as the result of a heart attack suffered late in March. Ready served as chief consulting engineer in the National Power Survey conducted by the Federal Power Commission, from 1933 to 1936. He was formerly chief engineer of the California Railroad Commission and was a member of the California State Water Resources Board at the time of his death.

HENRY M. TAYLOR, district manager of Ruud Manufacturing Co. in the state of Iowa, died of a heart attack in Mason City, Iowa, on May 1. Taylor joined the Ruud organization in 1923 as a salesman in Cleveland, Ohio. Successively, he was district manager in Milwaukee, Louisville and in Cedar Rapids.

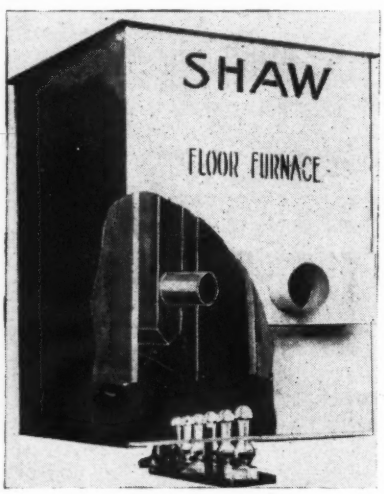
KNOX LEE, 60, vice president, director and division manager of Southwestern Gas & Electric Co. and civic leader in Marshall, Texas, died on April 9.

BENJAMIN H. DONOVAN, 76, vice president of the Pennsylvania Gas Co., died at Warren, Pa., on April 4. He had resided in Warren for 29 years. Surviving are his wife and three sons.

Announcing!

Immediate Delivery On . . . .

45,000
and
55,000
B.T.U.



AGA
Approved

CONSTRUCTION

16 gauge pressed steel 24" x 24" grill, welded corners, baked-on brown finish. Heavy 26 gauge galvanized steel outside shell with double lip on top. 24 gauge removable inside shell. Pittsburgh seams—practically water tight. Approximate weight 155 lbs.

BURNER and COMBUSTION CHAMBER

Economical air cooled burner—16 gauge black steel sheet combustion chamber, electrically welded. Both positively guaranteed for life of the furnace, replaceable by SHAW BURNER CO., INC., to the dealer.

CONTROLS

Furnished either manually operated or with Minneapolis-Honeywell Automatic Controls—with 100% cutoff on main burner and pilot. Also supplied with White-Rogers Sampsel and General Controls. Either Natural Gas or L.P.G.

"To Shawburnize is to Economize"

Manufactured by

SHAW BURNER COMPANY, INC.

P. O. BOX 203 —— PHONE 2274

Arkansas City, Kansas

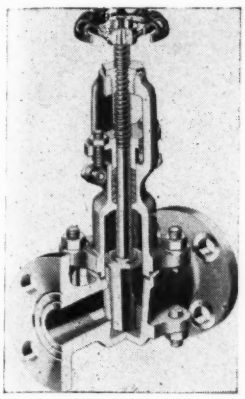
NEW PRODUCTS

Plug Gate Valves

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.

MODEL: Plug Gate Valves.

APPLICATION: Provide straight-through flow in the wide open position as do conventional gate valves and are suitable for throttling service as globe valves.



DESCRIPTION: These corrosion - resistant plug gate valves are said to combine the advantages of the two most important basic types of valves, as explained above. Crane Research Laboratories, after extensive testing, claim the following advantages:

1. They offer very little resistance to flow in the wide-open position, having a maximum discharge equal to that of a wedge gate valve and about twice that of a globe valve.
2. The design permits very close throttling at both high and low velocities.
3. Resistance to cutting action of the fluid when in a throttled position is equal to that of conventional plug type globe valves.
4. The valve is not subject to sticking in the closed position, even if it is closed while hot and opened when cold.
5. There is no tendency to galling, which is prevalent in alloy wedge gate valves, especially in the small sizes.

Of outside-screw-and-yoke design, the new valves have bolted bonnet joints and are available with either screwed or flanged ends in sizes from ½ to 2 in. They are regularly furnished in either 18-8 Mo or Monel metal. For particular corrosive conditions they can also be made in various other alloys to customer's specifications.

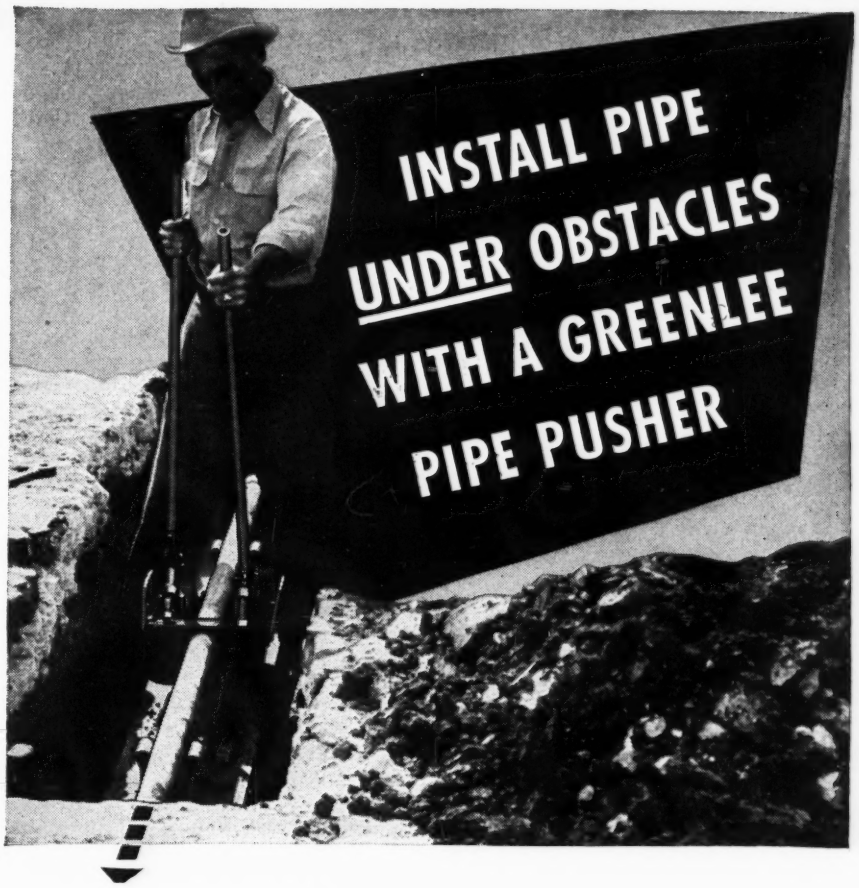
Air Compressor

SULLIVAN DIVISION, JOY MANUFACTURING CO., Oliver Bldg., Pittsburgh 23, Pa.

MODEL: Unitair Compressor.

APPLICATION: Nine sizes are available for power requirements ranging from 15 to 100 hp and piston displacements from 81 to 590 cu. ft. per minute at 100 lbs. discharge pressure per sq. in. based on 60 cycle motor speeds. Compressed air source for small manufacturing plants, in foundries, or for stand-by service.

DESCRIPTION: Requires a small foundation because of compact construction and smooth, vibration-free operation. Cost of installing water-piping and of supplying water for cooling are eliminated as all Unitairs are completely air-cooled. The three standard electric drives include built-in motor,

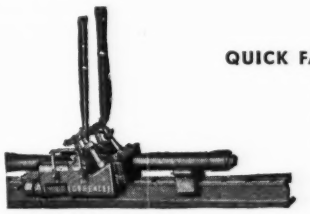


Cut costs, save time on underground pipe installations. With a GREENLEE Hydraulic Pipe Pusher *one man* can push pipe through the ground *easily, quickly*—under obstructions!

Save the time, work and inconvenience to all caused by the old methods of tearing up floors, lawns and pavement. Eliminate tedious back-filling, tamping, tunneling, re-paving (just a short trench accommodates the pusher.)

Save with the GREENLEE, which often pays for itself on the first few jobs used. Learn all about this compact, portable, powerful pipe installing equipment . . . get free Folder S-117. Greenlee Tool Co., Division of Greenlee Bros. & Co., 1946 Columbia Avenue, Rockford, Illinois, U. S. A.

REGISTERED TOOLS
GREENLEE
FOR THE CRAFTSMAN



QUICK FACTS ABOUT THE GREENLEE HYDRAULIC PIPE PUSHER

Easy—one or two men can easily operate on any job. *Portable*—compact, easy to carry to job and set up. *Fast*—operates at six different speeds. *Two models*—(1) for pipe up to 4-inch; (2) for larger pipe, drainage ducts, concrete sewer pipe. Do the job easier, quicker with a GREENLEE.

direct-connected motor and V-belt drive. They may also be equipped for use with gasoline or diesel engines.

Some of the outstanding features in-

clude: force-feed lubrication through rifle-drilled oil passages by means of a positive, gear-driven pump; "Cascade" oil cooling to reduce oil consumption and oil sludging; low-lift, large port-area, direct concentric valves for high efficiency; low piston speeds for long life; oversize ball-type main bearings for low maintenance; four piston rings per piston mounted above the pin for oil economy and for long-lasting air compression efficiency.

Electrode

AIR REDUCTION SALES CO., 60 East 42nd St., New York 17, N. Y.

MODEL: No. 375 Electrode.

APPLICATION: For machinable welds on cast iron, especially in the automotive field for production line repair work and for use on all castings requiring machinable welds.

DESCRIPTION: This is an electrode with a high nickel core wire and a heavy extruded coating that has a possible application wherever an electrode is used on cast iron. Because of its high nickel content it flows well and the resultant deposit is sound. The weld and fusion zone is soft and easy to machine. Also, it will withstand hydrostatic pressure and may be used with ease in the downhand, vertical or overhead positions. Multiple pass welds can be made without danger of cracking.

May be used on either AC or DC and is available in 5/32-in. and 1/8-in. diameters.

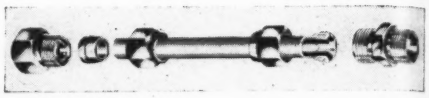
Appliance Connector

DARRA-JAMES CORP., Waterbury, Conn.

MODEL: Tube-Tite.

APPLICATION: Assures full flow of gas and 100% safety. It is claimed that Tube-Tite is the only connector on the market permitting full flow of gas.

DESCRIPTION: The connector is all aluminum tubing with two fittings, each provided with a V-lock machined joint which forms a completely vapor-proof seal with natural, manufactured or bottled gas. A specially designed insert reinforces both the inside and outside of the tubing at each end. As tubing is inserted into slot of cap, an evenly controlled tube spreading takes place. Splitting of tube at point of connection is therefore eliminated. The inserts have inside and outside V-lock



machined surfaces which seat into a corresponding set in the fitting. When tightened, the nut bears on the insert cap only and not on the tubing or fitting. The manufacturer claims that one man with an ordinary wrench can make a permanent, leak-proof connection with Tube-Tite in less than two minutes. The connectors are in production in lengths from 24 in. to 60 in.

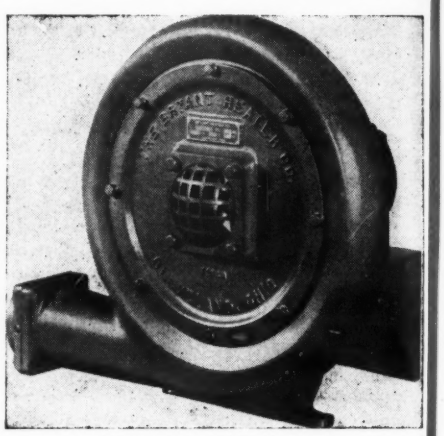
Centrifugal Blower

BRYANT HEATER CO., 1020 London Road, Cleveland, Ohio.

MODEL: Hi-Flo Blowers.

APPLICATION: For constant pressure output over a broad capacity range.

DESCRIPTION: These direct-connected centrifugal machines are sturdily constructed of aluminum housings, bases and side plates, with a simplified lightweight steel impeller for smooth operation and low bearing load. They are designed for ease of mounting in con-



junction with other units, and any of seven outlet positions may be chosen in a simple changeover scheme. A flanged outlet connection does away with pipe unions in the air line. To permit the use of standard 3450-rpm motors with regular shaft extension, a special hub arrangement has been incorporated.

The blowers initially available in this series range from 2 in. to 6 in. in outlet pipe size, supplying 100 to 525 cfm in the 4-oz. pressure classification, and in 2-in. and 3-in. outlet sizes furnishing 125 cfm. at 18 oz., and 275 cfm. at 16 oz., respectively. Powering motors range from 1/3 to 2 hp. for these machines, with power requirements in direct proportion to the actual amount of air used.

Deep Sea Fryer

SPECIALITIES APPLIANCE CORP., 341 East Ohio St., Chicago 11, Ill.

MODEL: Twin 14-in. deep sea fryer.

DESCRIPTION: The double unit has a separate thermostat for each fry pot and is equipped with two large or four

THE ANSWER TO YOUR GAS ODORIZING PROBLEMS

Captan *Advantages*

1 Gas-Like Smell
2 Available
3 Volatile
4 Harmless
5 Economical
6 Easy to Handle
7 Uniform
8 Doesn't Fade Out

NATURAL GAS ODORIZING CO., INC.
7620 WALLISVILLE ROAD
HOUSTON, TEXAS

WANTED: YOUNG MAN, ENGINEERING EDUcation, with ability to write reports and make contacts. Preferably with publication experience. $300.00 per month. Give complete details of education and business experience in first letter. Address Box 25, GAS, 1709 W. 8th St., Los Angeles 14, Cal.

ENGINEER WANTED

"Engineer" preferably not over 40, for development design and testing of gasfired residential heating equipment. Should have experience with manufacturer of such equipment. Location East, steady employment with well-known manufacturer.

BOX 50, GAS
1709 W. 8th St., Los Angeles 14, Calif.

EQUIPMENT FOR SALE

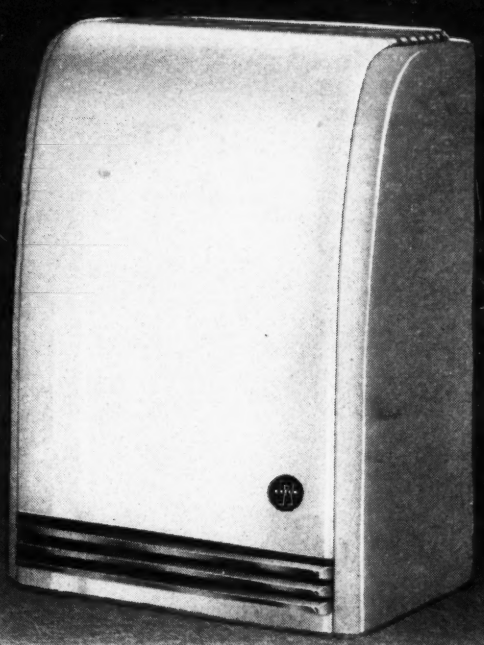
Complete 4½ foot Water Gas Set in good condition. Includes all necessary items for manufacturing gas of 528 Btu. GARDNER GAS, FUEL AND LIGHT CO., 2 Vernon Street, GARDNER, MASS.

GAS ENGINEER WANTED

Graduate Engineer with field experience on gas fired heating and water heating equipment, to take charge of field service training for firm with national distribution. Must have good personality and the ability to conduct service schools. Will be required to travel as territorial work demands.

BOX 150, GAS
1709 W. 8th St., Los Angeles 14, California

LET BEAUTY BUILD YOUR HEATER SALES



New RHEEM gas console heater

Women customers will like the simple gracious lines of this Rheem gas console heater. Its handsome antique finish brings new beauty to any interior. Tall functional design increases heat circulation and requires less floor space. Narrow base of heater permits installation on strip between wall and rug.

Sales are easy because the low price and economical operation fit any budget. Approved by American Gas Association, whether vented or unvented. Available in three popular sizes: 25,000; 35,000; 50,000 B.T.U. Get full information today. Write Rheem, 570 Lexington Avenue, New York 22, New York.

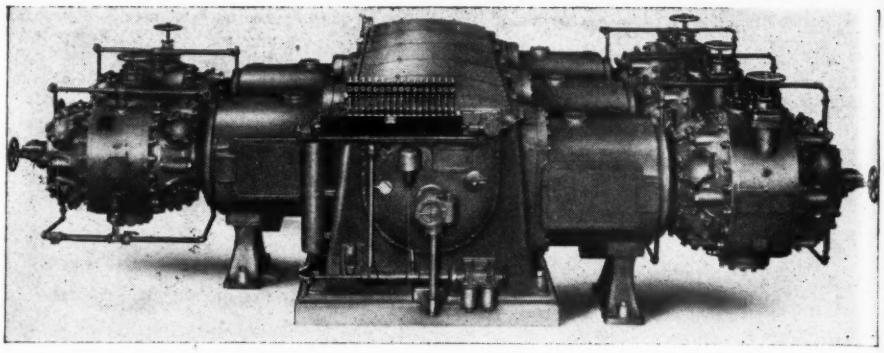
RHEEM... *making houses into homes*

RHEEM

split baskets. Heat for the unit is automatically controlled by Robertshaw thermostats, located away from the heat. Heavy duty burners provide rapid recovery of temperature and fast production. A "cold zone" below the heating tubes provides for the collection of

crumbs and particles away from the heat where they cannot burn and affect the quality of the frying fat or oil. This "cold zone" residue can be drained off by a lever-operated dump valve.

Height is 35½ in., width 33½ in. and depth 26¼ in. Fat capacity, 56 lbs. Shipping weight, 255 lbs. Seven other models in the line provide a wide choice for individual requirements.



Space-Saving Compressor

THE COOPER - BESSEMER CORP., Mount Vernon, Ohio.

MODEL: Type JM compressor.

APPLICATION: Especially adaptable for use in chemical, process, oil and gas, mining, construction and general manufacturing industries.

DESCRIPTION: Available in six sizes with a great variety of compressor cylinders, the JM offers a wide range of volumes and pressures for handling air or gas. Built with from one to six crank throws and ranges in horsepower from 500 to 2750. All cast parts are of Meehanite metal. The one-piece box-like frame is open at the top for admitting the crankshaft and is locked by steel tiebolts and covered by aluminum plates. A sump type base holds the lubricating oil supply, and the lubricating system, which includes a pressure pump and built-in filter and cooler, furnishes oil under pressure to all moving parts. Dimensions range from 11 ft. 7 in. to 24 ft. 6 in. in length, and from 13 ft. 9 in. to 24 ft. 2½ in. in width. A special bulletin on the Type JM is available upon request.

Temperature Control

CLAUD S. GORDON CO., 3000 S. Wallace St., Chicago, Ill.

MODEL: Xactline Capacitrol.

APPLICATION: For precision temperature-variation control.

DESCRIPTION: This new instrument combines in one complete unit the outstanding features of the Claud S. Gordon Co.'s Xactline control unit and the Wheelco Instrument Co.'s electronic principle Capacitrol. The features which are brought together in the new Xactline Capacitrol are, for Xactline: the "anticipating" factor which holds temperature tolerances as close as 1/5° F plus or minus and power "on-off" cycles as short as 3 seconds; positive electrical action—no gears, cams, motors, bearings or other mechanical crutches; simple adjustment for wide range control requirements, and low initial cost plus low-cost operation.

For Capacitrol the features are: the electronic control principle, instantaneous control action, direct reading indicating scale, separately enclosed measuring instrument, and interchangeable unit construction.

Available in two distinct models for varying requirements. Flush or surface mounting case plus simple design and compactness make installation a matter of only a few minutes. Literature available upon request.

WELSBACH EMERGENCY GAS SHUT-OFF VALVE

TYPE IHF-22 A.G.A. Certified

positively prevents overheating of gas water heater tanks

The Welsbach patented Emergency Gas Shut-off valve offers positive protection, because it shuts off the main gas burner before excessive temperatures can be built up. Connects directly with the hot water in top of the tank through the hot water outlet. Patented enclosed type chemical fuse cartridge. Easy to replace. *The best possible insurance against defective thermostats.*

Approved and Used by Leading Gas Companies.
Available in ½" to 1½" I.P. sizes.

also

Ground Key Gas Stops—Regular and High Pressure.
Meter Connections.

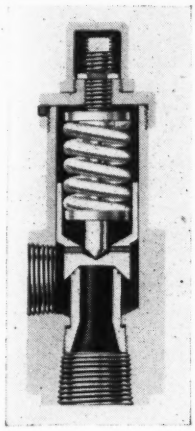
Write for Descriptive Literature and Prices.

KITSON DIVISION
THE WELSBACH CORPORATION
1500 WALNUT ST. PHILADELPHIA 2

Relief Valve

FARRIS ENGINEERING CORP., 489 Commercial Ave., Palisades Park, N. J.

MODEL: No. 2745 bar-stock safety release valve.



APPLICATION: For pressures up to 10,000 psi.

DESCRIPTION: The valve is fabricated completely from bar stock—bronze, cold rolled steel or stainless steel, depending on the service for which it is intended. In either case the disc and nozzle are of stainless steel. Available with or withuot test gear, in three body sizes—½ in., ¾ in. and 1 in.—interchangeable nozzle inserts provide for proper capacity at set pressures in three ranges—2000, 5000 and 10,000 psi for each size.

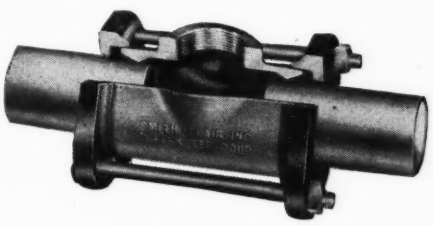
Exceptionally high flow efficiency, with a coefficient approximating unity, is obtained by virtue of the high lift of the disc brought about by the high kinetic energy of the discharge developed by the venturi action of the nozzle. The number of parts normally required in a valve for such services has been reduced. The top-guided disc piston with its two-point bearing surface is completely free acting. Both bottom inlet and side outlet connections are tapped directly in the valve body. High carbon steel loading spring is completely enclosed and protected. Nozzle seat is well above the drain line, hence remains dry and is not subject to accumulations of scale or sediment.

Flexible Tee Coupling

SMITH-BLAIR CO., South San Francisco, Calif.

MODEL: Flexible tee coupling.

APPLICATION: According to the manufacturer, this coupling offers a simplified and more economical way of



connecting laterals to existing pipe lines.

DESCRIPTION: Design of the coupling eliminates the need for field threading in the trench and does away with flexible couplings, nipples, tees and unions. The flexible tee is available for 2-in. cast iron, standard and O.D. pipe and for other sizes to as small as ¾ in. In each, the outlet is the same nominal size as pipe run but has standard threads which permit the use of a bushing where needed.

SALES SLANTS

Servel Promotion Stresses Dealer Cooperation

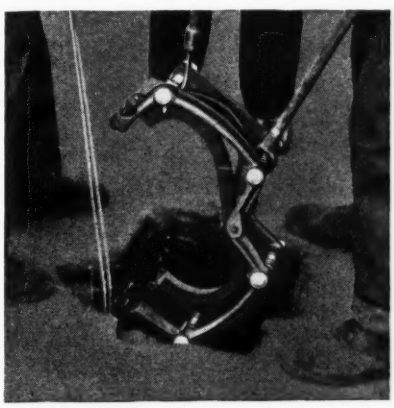
Servel, Inc. has released to the gas industry a refrigeration portfolio for 1947, showing the firm's complete advertising and sales promotion program. R. J. Caniff, advertising and sales promotion manager, pointed out two special features of the portfolio: "Memo to Management" which is a quick-reading digest of important facts about the refrigeration load, and six descriptive file folders which contain all available advertising materials put out by Servel.

The 1947 gas refrigerators were presented to cooperating dealers and special representatives of Brooklyn Union Gas Co. at four recent meetings attended by 500 dealers. James Landreth, Edward Perry and Robert Stevens, all of Servel, conducted the meetings. The streamlined Servel ball tank water heater was also on display, and its features were explained at the meetings.

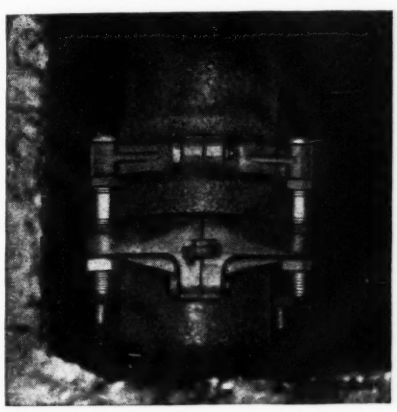
Another Brooklyn Union plan for cooperation with Servel dealers is the cooperative advertising campaign, designed to reach 1,847,247 readers, which opened with a full-page newspaper advertisement. The Brooklyn Borough Gas

NORMAC
BELL JOINT CLAMP

6 inch NORMAC clamp being lowered into hole for installation



6 inch NORMAC clamp in service after installation



Solves Your Joint Repair Problems

- **QUICK**
- **EASY**
- **PERMANENT**

Installed in pavement openings 1' x 1'. Available in all standard sizes from 3" to 12". A simple set of tools cleans the joint, installs the clamp . . . often in only a quarter of an hour. SAVES TIME. SAVES MONEY and the repair is permanent. Designed for all conditions particularly where pavement repair costs are prohibitive. Write for literature illustrating this simple solution to one of the Gas Industries most trying problems and ask for our catalog describing our complete line of

COUPLINGS . . . FITTINGS SERVICE TEES and ELLS SLEEVES . . . COMPRESSION-END COCKS . . . COMPRESSION-END METER BARS

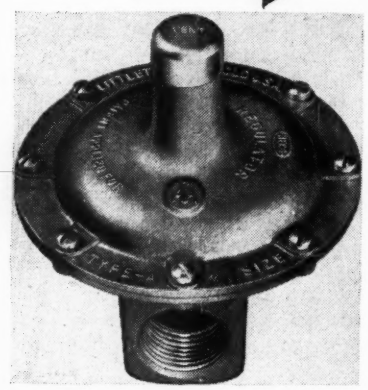
NORTON-McMURRAY MFG. CO.
39 SOUTH LA SALLE ST. • CHICAGO 3, ILL.
Method and product covered by U.S. Patents, Nos. 2,163,261 and 2,178,286.

HECO'S *New* PRECISION DIE-CAST Gas Appliance REGULATOR

Designed, engineered and produced complete by Heco, units are individually tested to assure close control at minimum maintenance cost.

Available for Immediate Delivery

- PRESSURE DIE-CAST FROM FINEST ALUMINUM ALLOY
- BRASS-TO-BRASS SEAT
- CORROSION-RESISTANT INTERNAL PARTS
- LOWER SHIPPING COSTS
- CLOSE CONTROL
- HIGH CAPACITY
- LOW MAINTENANCE
- INDIVIDUALLY TESTED
- APPROVED BY A. G. A.

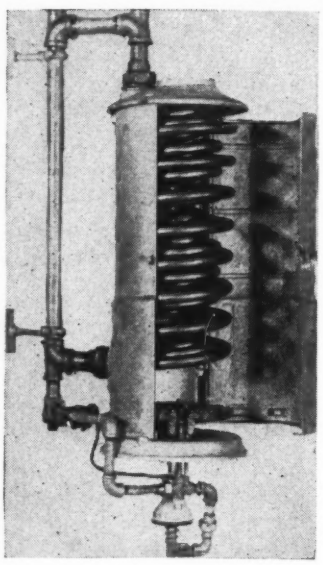


INSIST ON THE *New* HECO REGULATOR FOR PRECISION PERFORMANCE

New, too, is the line of HECO Precision Machined Brass Valves and Cocks. Write for prices, Catalog No. 47 G on the complete line, giving jobber's name.

TESTED AND ·HECO· PROVED PRODUCTS

HECKETHORN MANUFACTURING & SUPPLY CO.
LITTLETON, COLORADO, U.S.A.



THERMOSTATIC
INSTANTANEOUS
PATENTED

Approved by
International Gas Association
Gas Combustion Engineers

HOTOMATIC
GAS WATER HEATERS

The water heater that is in a class by itself—no storage tank is necessary. Should give 40 years continuous service.

Our Butane 100% Safety Pilot is the simplest on the market—easily understood by the customers.

No. 1 Heater—heats 60 g.p.h.
No. 2 Heater—heats 90 g.p.h.
No. 3 Heater—heats 180 g.p.h.
No. 3 Battery Heaters — for large quantities of water

Write for Folder and Prices or—Order One and Take Your Chance.

Many of these Heaters Have Been in Continuous Use for 17 Years.

Manufactured by

LITTLE GIANT
WATER HEATER COMPANY
907 7th St. Orange, Texas

Co. and Kings Appliance Corp. are also sponsors of this intensive campaign. A similar drive, employing car cards in subways and elevated lines, began on May 1 and will continue for six months.

Another phase of Servel's promotional program is directed toward its all-year gas air conditioner. The Houston Natural Gas system has been selected as a national testing area for the sale of this unit, and despite material shortages elsewhere, the supply of air conditioners for Houston Natural customers will be unlimited during 1947. Aim of the plan is to install a unit a day, or 250 units during this year. The two companies are spending $12,000 in newspaper ads, radio spot announcements and station breaks, and direct mail solicitation. Progress of the sales program will be under constant observation of Servel, the advertising agency, and Houston Natural officials.

Two training courses, organized by Southern Counties Gas Co., Los Angeles, in cooperation with Servel, Inc., opened in April to prepare salesmen for a campaign to promote sales of the Servel air conditioning unit. Vice President Norman R. McKee reported that Southern Counties has given support to Servel in the development of the unit and is preparing an aggressive sales and advertising campaign to get the appliance on the market.

Dearborn Market Survey

Dearborn Stove Co.'s research department has conducted a survey through which it was determined that gas space heater manufacturers face a market in California, Washington, Oregon, Arizona and Nevada which can potentially absorb 3,111,198 units. This estimate is based on data from the Bureau of Census, Federal Power Commission and other reliable publications.

The survey states that the state of Washington seems of comparatively small present or future value to gas stove manufacturers seeking sales outlets, due to the supply of low-cost electricity. No natural gas is served in Oregon, so only through an increase in LP-gas installations will there be an increase in gas heating in that state. Gas space heating is provided in 961,797 homes, 61.2% of all residences, in California. With 8% of the total of U. S. natural gas reserves in the state, continued reliance on gas space heating is practically guaranteed. It is reported that 238,526 space heaters are required annually for replacement in California. Increases in Nevada depend upon conversion to LP-gas. Of the 115,827 Arizona homes (92.1%) without central heat in 1940, 19,654 were using gas as the fuel. Gas ranks third in use among the four types of fuel in Arizona.

Of primary interest to manufacturers of gas space heaters is the fact that the population in the Pacific States area is moving from rural sections to urban centers. Any large increase in the market for gas space heaters, however, seems to depend upon an increase in LP-gas usage.

SALES SHORTS

AMERICAN STOVE CO., with more than 6000 of its ranges now being used in schools, has prepared to perpetuate and protect the market for gas companies and Magic Chef dealers with a new school installation program. The

school receives the newest Magic Chef at the dealer's regular cost plus a small fee for installation. Then the school will have a new Magic Chef every two years (or as new models come out) for 10 years for the one initial investment. The home economics department gets continued servicing privileges.

WARD HEATER CO., Los Angeles, recently sponsored a huge "welcome home" party for its entire plant force in honor of sales representatives from all over the country who had gathered for a week-long meeting on sales policies, advertising, new furnaces and improvements, service to dealers and customers, allotments, installation problems, etc. Shown at the microphone is H. C. "Sandy" Sanderson, factory representative from Pittsburgh, who responded to the welcome from officials and employees for the visitors. Gathered on the stage are Ward old-timers—employees who have served the firm for five to 25 years.

THE AMERICAN GAS ASSOCIATION has several new promotional aids available, including the second in a series of three national ads featuring the use of gas-heated water in the laundry, kitchen and bath. "The Flame of Freedom" is a new sound-slide Kodachrome film, sponsored by AGA and GAMA and produced by the New Freedom Gas Kitchen Bureau, available to gas companies for $35 f.o.b. New York. There are 101 separate shots which take 17 minutes to run. Newspaper ad mats are offered to gas companies for tie-in with the local showing of the movie, "It Happened on Fifth Avenue." The ads call attention to the all-gas kitchen in which much of the film's action takes place.

THE BROOKLYN UNION GAS CO. recently cooperated with Bloomingdale Brothers, Inc., a Brooklyn department store, when the store's salesmen were instructed in oven cookery, top burner meals, use of broiler and use of refrigerator. Brooklyn Union's New Business department offered the classes as a sales aid to encourage the purchase of higher grade equipment and to inform consumers of new and improved range features. Don Johnston of Hardwick Stove Co. explained features of 1947 Hardwick ranges.

53% More Fire-Fighting Power

THE MASTER OF FLAME ANSUL FIRE EXTINGUISHING EQUIPMENT duGas

with the NEW Ansul-Dugas Dry Chemical Fire Extinguisher

Engineered to provide 53% more and faster fire-stopping power, the NEW Ansul-Dugas Fire Extinguisher is ready to use—IN A FLASH—on Class B and C fires. The wide heat-shielding stream of Ansul Plus-Fifty Dry Chemical from the specially designed nozzle makes extinguishing more certain even by inexperienced employees.

STOP FASTER!

HERE ARE OTHER PLUS FEATURES

- Quicker, easier, on-the-spot recharge right after use.
- Highest Rating for SPEED and EFFECTIVENESS as determined by impartial authority.*
- New, wider coverage type nozzle with long range effectiveness.
- Greater fire-fighting power pound for pound, dollar for dollar.
- Increased fire-fighting capacity without increased weight.
- Engineered to resist corrosion.
- Ansul Plus-Fifty Dry Chemical is nontoxic, non-abrasive, non-corrosive.

*Write for charts based on authoritative data of comparative ratings as determined by a national approval agency.

ANSUL CHEMICAL COMPANY
FIRE EXTINGUISHER DIVISION, MARINETTE, WISCONSIN

TAPECOAT Those "Weak Links"

In Your Fight Against Corrosion...

It doesn't make sense to protect pipe with quality coatings and then use makeshift protection on pipe joints. After all, protection is only as good as its weakest joint.

That's why more and more distribution engineers are standardizing on TAPECOAT—the dependable wrapping in tape form that provides pipe joint protection equivalent to the mill coating on the pipe.

TAPECOAT is easy to apply. You simply spiral wrap the joint, starting and ending on the mill coated pipe, thus making the protection on the joint equal to the coating on the pipe. It will pay you to guard against those "weak links" with TAPECOAT.

Write for complete details.

The TAPECOAT Company

1523 LYONS STREET EVANSTON, ILLINOIS

BENDIX HOME APPLIANCES, INC. is conducting training schools for distributor service managers in eight cities. Trainers are two factory teams—J. A. Boyer and W. H. Hollett, A. A. Smith and K. H. Teeter. Training points for the firm's 79 distributors are Boston, New York, Chicago, Pittsburgh, Atlanta, Kansas City, Dallas and San Francisco.

Home laundry forums are scheduled to take place in three large department stores under auspices of the store, Bendix Home Laundry Institute and distributors. They will be directed by Miss Margaret B. Doughty, institute director, at Linn & Scruggs, Decatur, Ill.; G. Fox & Co., Hartford, Conn., and F. & R. Lazarus Co., Columbus, Ohio. Open to the housewives of these cities, the forums will detail simplified home laundering methods, information on care of synthetic fabrics, and laundry planning. The complete home laundry will be demonstrated and questions on individual problems answered.

CONSOLIDATED EDISON CO. OF NEW YORK, INC., is offering night courses on the installation, adjustment and starting of gas appliances. The courses are open to plumbers, heating contractors, cooperating appliance dealers and builders in the territories served by the firm. More than 800 persons have registered, and each class is limited to 20 so that all receive individual attention and witness the demonstrations of equipment which accompany the lectures. Automatic gas water heaters, gas conversion burners, gas space heaters and domestic gas ranges are covered in three two-hour lectures given by the Service Bureau of the Distribution Operation and Sales departments.

B. C. ELECTRIC RAILWAY CO. has made an analysis of the types of outlets selling the largest quantities of automatic storage water heaters, in response to inquiries received from dealers and distributors. It was revealed that during January and February in Vancouver a total of 170 automatic heaters were sold, 117 by electrical appliance dealers and 53 by plumbing and heating firms. Sales of major gas appliances in the Greater Vancouver area during February reached a valuation of $30,133, including 178 ranges, 34 automatic storage water heaters, four tank water heaters and one gas refrigerator.

DUN & BRADSTREET has compiled for "Life" magazine a tabulation of retail outlets in each of 14 lines of trade, showing the percentage of retail stores in each of the nine census regions of the U. S. Since no census of retail trade has been taken by the government since 1939, these figures are intended to serve until official census facts are again available.

MULLINS MANUFACTURING CORP., Warren, Ohio, has produced a six-page, four-color folder which shows the wide variety of kitchen arrangements possible with Youngstown Kitchen units. Especially designed for architects, the folder contains construction specifications and details of Kitchenaiders and wall and base cabinets.

HOOK & ACKERMAN, INC., New York and Pittsburgh, manufacturers of Hydrotherm gas-fired boilers, announced a price reduction of 3 to 8%, effective May 1, in an effort to cooperate with the national program to reduce building costs.

GEO. D. ROPER CORP., as a step in its postwar merchandising plan, has mailed to each retailer an elaborate new selling package, developed under the direction of Cy Edwards, advertising manager. The Roper plan includes direct mail, national and trade advertising, newspaper ads, display material, sales visualizers, product catalogs, special announcements, pieces for dealer distribution, a sales facilities unit and service training books.

KAISER FLEETWINGS, INC., Oakland, Calif., has announced that the Kaiser dishwasher, powered by water pressure direct from the home hot water line, is now on the market. The machine is described in a new sales portfolio which includes a cutaway view with copy enumerating advantages claimed and a number of photographs of the appliance in production and in action. Only two connections—to the water pipe and the drainage outlet—are needed. There are three controls for (1) raising and lowering the basket, (2) rinsing, and (3) washing. Jets in bottom of basin are spaced so that hot water reaches every surface. Screens around jets prevent food particles from being recirculated.

TAMPA (FLA.) GAS CO. has announced the opening of a permanent, all-steel demonstration kitchen, combining all the time-saving devices of the postwar kitchen. Under the direction of Mrs. Mary Dorn, home service economist, and her assistant, Miss Marea Bordt, weekly children's and bride's cooking classes will be scheduled. The kitchen will also be available for demonstrations by appointment for local organizations.

CRIBBEN & SEXTON CO., Chicago, is telling homemakers about the features of its Universal gas range in color ads in national magazines which will reach an estimated 36 million readers per issue. Arrangements have been made for local dealers to tie in the national ads in their home markets with an assortment of newspaper mats, window streamers and counter cards.

LETS PUT OUR HEADS TOGETHER
FOR HIGHEST HEATING PROFITS

Here's one for the
BOOK
(Bank, that is!)

Hard to believe . . . the efficiency and economy of Pacific Floor Furnaces. But, put it down in your (Bank) Book that here's a real money-maker for Pacific Dealers from Coast-to-Coast.

The Pacific Floor Furnace is available in sizes and capacities for small to medium homes. It is easily installed and serviced. It requires no ducts or pipes —a profitable item for heating appliance dealers.

Built to the rigid standards that have made Pacific a respected name in the gas heating industry for a third-of-a-century, Pacific Floor Furnaces can make sales history in your community.

Investigate the Pacific Dealer franchise *now!* Complete line-up of gas heating equipment includes Console Heaters, Floor and Dual Register Furnaces, Winter Air Conditioners, Gravity Furnaces, Suspended Unit Heaters and Duct Furnaces.

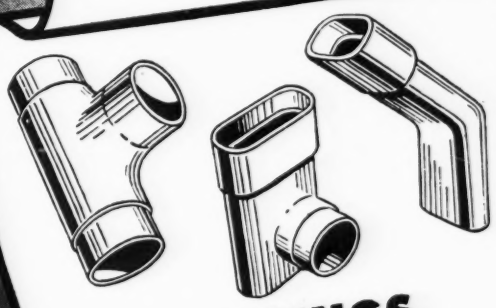
Gas Heating Specialists for more than a third-of-a-century

PACIFIC MFG. CO. HUNTINGTON PARK CALIFORNIA

Pacific Heater Division
NACO MANUFACTURING CO.
P. O. Box 310, Huntington Park, California

Johns-Manville
TRANSITE FLUE PIPE
for domestic gas-burning appliances

EASY TO INSTALL
comes in both round and oval shapes

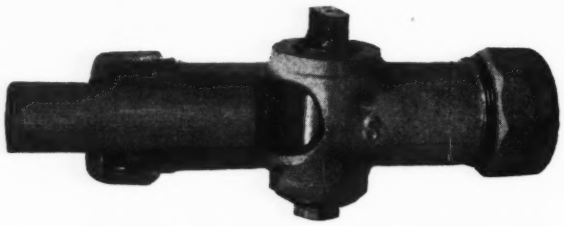


FITTINGS for EVERY PURPOSE

and it's an asbestos product
COMPLETELY RUSTPROOF!

Write for our brochure TR-13A.
Address
JOHNS-MANVILLE
Box 290, New York, N. Y.

JOHNS-MANVILLE JM PRODUCTS



Stopcocks with Compression Gasket Ends
(Cutaway Section Shows Depth and Assembly)

Iron Body Brass Core Stopcocks

Meter Bars
4-Types - - - Numerous Styles

Brass Lever Handle Control Valves

The LATTIMER-STEVENS COMPANY
715 Marion Road Columbus 7, Ohio

CLIP THIS AND MAIL TODAY

IF YOU ARE NOT A REGULAR SUBSCRIBER TO **GAS**

In GAS each month you will find dozens of ideas that will help you know your business better and do your job better. Just one of these ideas coming to you on our pages can pay you many, many times the small cost of a subscription.

GAS ... 1709 WEST EIGHTH ST.,
LOS ANGELES 14, CALIFORNIA

Please enter my subscription to GAS for ...

1 YEAR $2.00 ☐

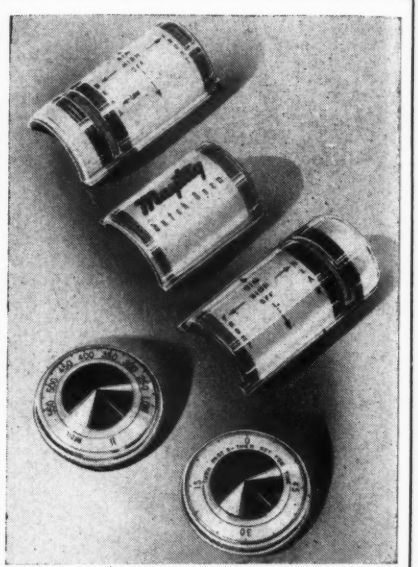
☐ Check is enclosed ☐ Please bill me

NAME_____ POSITION_____

COMPANY_____

STREET CITY ZONE STATE

SAN DIEGO GAS & ELECTRIC CO. is conducting a national advertising campaign to attract new industry to its area. From the ads, which are appearing in five national magazines, 376 replies have been received, and these prospects are being turned over to the industrial department of the Chamber of Commerce for follow-up. Representatives of three firms are already reported to have visited San Diego to consider factory sites.



CONSOLIDATED MOLDED PRODUCTS CORP., Scranton, Pa., is manufacturing five plastic parts for the new Maytag Dutch Oven range, product of Globe American Corp. Parts consist of two conical dials and three semi-circular valve handle parts. All five elements feature recessed lettering molded from the rear and paint-filled in bright red, silver and gray. Chromed metal shields are clipped to the front of the two dials. Plastic was selected after a series of tests proved the material capable of withstanding heat and retaining a permanent finish.

HAMILTON MANUFACTURING CO., Two Rivers, Wis., has published a Service Instructions Manual to aid servicemen in maintaining its automatic clothes dryer. The 28-page book, punched for insertion in any loose-leaf cover, is divided into four main sections covering: description of the dryer and its operation; installation; disassembly, inspection, repair and reassembly; and a "Trouble and Remedy Chart." A foreword by President E. P. Hamilton explains the purpose of the guarantee and its limitations.

GAMA HAS ANNOUNCED a new "CP" trade paper advertisement, addressed to home economists, which is appearing in the May issue of "Better Foods" and the June issue of "What's New in Home Economics." Copy concerns new minimum requirements for automatic ranges built to "CP" standards.

COMMERCIAL IRON WORKS, Los Angeles, Calif., has announced the appointment of Gordon Z. Greene Co. as representatives in the California territory for commercial type CN orifice fittings and deadline orifice fittings.

CATALOGS

FISCHER & PORTER CO., HATBORO, PA.—A new, augmented bulletin describing Flowrator instruments for measuring flow rate of liquids and gases has been issued. It includes descriptions and illustrations of instruments, both assembled and disassembled. Numerous new accessories are shown, including a horizontal line adapter which makes it possible to insert the meters as easily in horizontal runs as they previously could be inserted in vertical pipes. Details of front and rear panel mounting, rear lighting arrangements, steam heating coils, and alarm devices are among the items described.

WAILES DOVE-HERMISTON CORP., WESTFIELD, N. J. (Subsidiary of Koppers Co., Inc.)—A four-page, two-color pamphlet gives details of and uses for Koppers Bituplastic, a new plastic protective coating that waterproofs and vapor seals. Lists its special adaptability for use on aboveground tanks, gas holders, storage tanks and towers, cooling towers, etc., and its ability to waterproof and dampproof any wall surface of metal, masonry or concrete. Provides details regarding its quick drying, fire and temperature resistance, and application with brush or spray. Includes data on types of Bituplastic and special recommendations for use of each.

DOW CORNING CORP., MIDLAND, MICH.—"DC Antifoam A," a compound for killing foam in acqueous systems, has, according to the manufacturer, proved its usefulness in a wide variety of industrial processes including steam distillation and vacuum evaporation, laboratory distillations and analytical procedures. This pamphlet describes its physical properties, outlines methods for using this silicone antifoam agent, and presents methods used for determining its efficiency.

FISHER GOVERNOR CO., MARSHALLTOWN, IOWA—Bulletin No. A-100, "Single Seated Inner Valves," pictures and describes the Micro-Flute and Micro-Form Pup (Proportional Uniform Percentage) inner valves which have equal percentage characteristics. Complete with flow curves. Bulletin No. D-2, "Relay Pilot Operated Pressure Controllers," features Series 4101 snap acting Wizard Pilots.

NACO MANUFACTURING CO., BOX 310, HUNTINGTON PARK, CALIF.—"Modern Heating" is the title of a new bulletin describing this firm's Pacific duct furnace, featuring a new basic heating element and duo-stage temperature modulation, for forced air heating and ventilating in all types of structures. The bulletin includes sizes and specifications, as well as installation instructions.

HYDRAUGER CORP., LTD., SAN FRANCISCO, CALIF.—A new 16-page bulletin explains the time and labor saving advantages of the firm's horizontal earth boring machines. The three new compressed-air operated models—10-A, L-2, and LHH-2 (a new hand-held model) are fully covered. The equipment bores underground holes from 2-in. to 14½-in. diameter.

ALLEGHENY LUDLUM STEEL CORP., PITTSBURGH, PA.—"Allegheny Metal in the Petroleum Industry" is a 33-page book, in color, explaining with copy, charts, graphs and photographs the role of stainless steel in the production and processing of oil. One section is devoted to "Allegheny Stainless Steel in Cycling Plants and Natural Gas Operations."

WHEELCO INSTRUMENTS CO., CHICAGO, ILL.—Information pertaining to the manufacture of several new lines, the redesign of some items to permit price reductions, lowering of prices on certain instruments and accessories and removal of the escalator clause is contained in an eight-page, two-color bulletin now available.

LESLIE CO., 92 DELAFIELD AVE., LYNDHURST, N. J.—Bulletin No. 462, "Engineering, Operating and Maintenance Data on Pressure Controllers, External-Pilot-Operated," illustrates in large cross-sections the design features of the company's control pilots and associated diaphragm regulating valves. Exclusive features claimed are wide selection of operating media, air, clean gas, water, and light oils; non-continuous leakage of operating medium; hard surfaced seat rings and 800 Brinell hardened stainless steel main valves; single seated, balanced construction; the Conden-Seal cooling bonnet, and reversing superstructure. Selection charts and capacity tables guide selection of equipment for specific applications.

From WARREN

Convert your small city gas distribution system to LP-GAS.

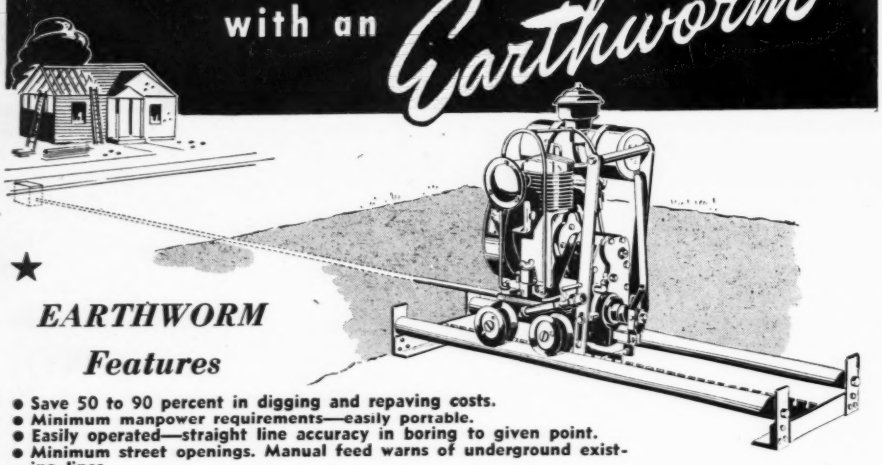
Plant conversion and adequate storage facilities not only assure your customers adequate fuel but it is your guarantee of efficient, uninterrupted service the year 'round.

Many utilities are including Warren's broad experience, engineering advice and consultation service in planning to convert to LP-GAS. Contact your nearest Warren office today regarding this service. Warren offers it without obligation.

"1922-Silver Anniversary Year-1947"

WARREN PETROLEUM CORPORATION
TULSA, OKLAHOMA
Detroit Mobile Houston

INSTALL UNDERGROUND LINES
FASTER—CHEAPER—
with an Earthworm



★ EARTHWORM Features

- Save 50 to 90 percent in digging and repaving costs.
- Minimum manpower requirements—easily portable.
- Easily operated—straight line accuracy in boring to given point.
- Minimum street openings. Manual feed warns of underground existing lines.
- Quickly pays for itself—average boring speed, 1½ ft. per min.
- Complete unit—requires no auxiliary equipment.

Over 60 percent of our post-war production has been purchased by pre-war users.

3 Models — Write for delivery and operating instructions.

Mailing Address: BOX 1100

Earthworm

BORING MACHINE • MANUFACTURED BY LUBE JACK CO., SANTA MONICA, CALIF.

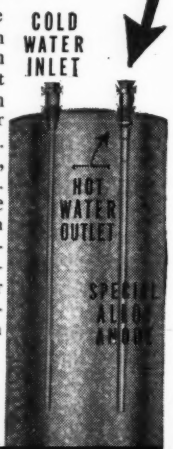
"Elno" Trade Mark Registered RUST PREVENTER

For Steel Hot Water Storage Tanks

Rust NO LONGER A Must!

"ELNO" eliminates the need for expensive non-ferrous or specially-processed tanks even where water is so highly-corrosive that such tanks have always been considered essential. It is not like some chemical "rust inhibitors" which merely bleach discolored water and do little or nothing to prevent rust or protect the tank. "ELNO" really routs rust, requires no attention, and causes no further expense after installation.

Get set now to tap an important new source of profit by offering your customers maximum security against rust and corrosion in the equipment you sell and service. The field is broad because "ELNO" is available in types and sizes for all makes of heaters and boilers. Write for technical, catalog, price and promotional information today.



PATENT APPLIED FOR

The Cleveland Heater Co.

2310 Superior Ave. Cleveland 14, Ohio

CLEAN, RUST-FREE HOT WATER AT LOWEST EQUIPMENT COST

CURRENT READING

Domestic Gas Research Technical Bulletins—AGA Testing Laboratories. Research Bulletin No. 41, "Research in Fundamentals of Noise of Extinction of Large Gas Burners," presents design relationships fundamental to minimizing noise of extinction in contemporary types of large burners operated on manufactured gas and includes factors affecting intensity of noise of extinction.

Effects of aerated blue and non-aerated yellow pilot flames on temperatures of flat strip bimetals under varying operating conditions are discussed in Research Bulletin No. 42, "A Study of Bimetallic Thermal Elements."

The domestic hot water service publication has been issued as Laboratories Report 1060-B, "Field Study of Domestic Hot Water Service from Gas-Fired Boilers." It describes the various types of equipment which have been interconnected with domestic hot water supply in order to supply year-round hot water service.

Gas Abstracts—Institute of Gas Technology, Chicago 16, Ill. This collection of abstracts selected from 81 periodicals is published and distributed monthly by the Institute. The contents of selected papers and patents are reviewed impartially by the editorial staff and material of potential interest to the gas industry is presented. Subscription rate to non-members of the Institute: $15 per year. Photostatic or microfilm copies of articles abstracted will be furnished to subscribers at cost. Copies of any abstract presented will be supplied on 5 x 8 cards on request.

Static Electricity—National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass. This 51-page book is the result of NFPA discussion and research since 1934 on the subject of static electricity as a fire cause. The present text, officially adopted on recommendation of the Committee on Static Electricity at the 1946 NFPA meeting, incorporates a number of revisions and new developments. Price, 50 cents.

American Safety Standards—Published by the American Standards Association, 70 East 45th St., New York 17, N. Y. This booklet contains a list of approximately 200 standards covering safety and industrial health. It not only lists the standards, but gives a brief description of their contents. Cost of each pamphlet is listed.

Current Publications—April, 1947—Compiled by the Library of the American Gas Association, 420 Lexington Ave., New York 17, N. Y. This list, which includes all current AGA publications, supersedes all previous lists. Prices for members and non-members are quoted on each publication.

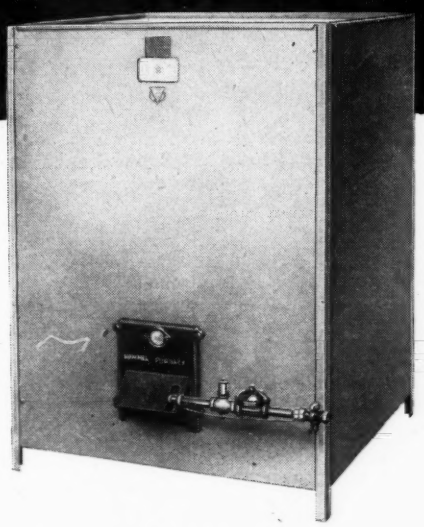
In the Service—Published by the Pennsylvania Grade Crude Oil Association, Oil City, Pa. This 18-page booklet, including more than 10 pages of photographs, relates highlights and sidelights in the war record of Pennsylvania oils and the Pennsylvania grade region.

Giving Longer, Better Service

Such as Hammel Heaters do...

Points the way to Volume Sales

And Mounting Profits, too!

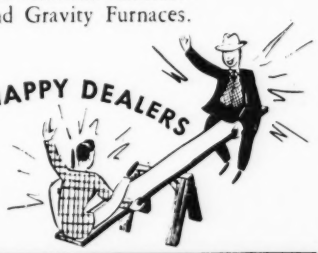


Always favorite, because of its ability to keep heating performance UP...operating costs DOWN...that's the Hammel Gravity Furnace ...a new high in *Automatic Gas Heating.*

Residences and commercial buildings, in particular are serviced by the gravity furnace with utmost efficiency...either singly or in a battery. For adequate supply of warmth, in room, suite or whole house...this modern furnace does an ideal job. Clean and quiet in operation. Easy to install and to service.

Complete data on special features and new structural specifications will be provided promptly upon receipt of your inquiry. Get the facts on a Hammel Furnace...make bigger heating profits with Hammel Comfortaires, Wall Heaters and Gravity Furnaces.

HAMMEL DEALERS ARE HAPPY DEALERS



Hammel

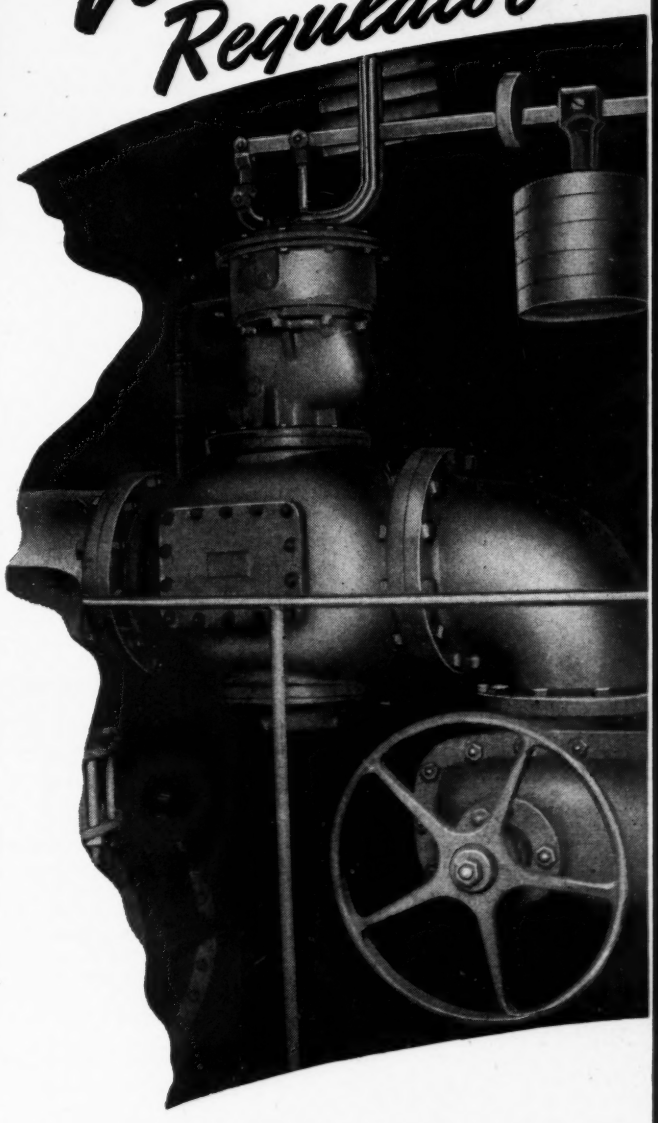
RADIATOR ENGINEERING CO.

A. S. Martinson & Associates

Successors to Hammel Radiator Corp.

3348 Motor Ave. SINCE 1912 Los Angeles 34

Reynolds KT Series Versatile Regulator



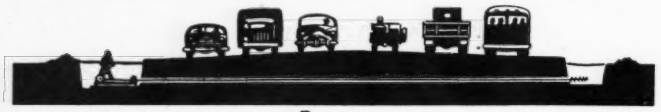
★ Reynolds KT Series Versatile Regulator is manufactured in a range of sizes from 2″ to 12″. It will reduce pressure to inches W. C.—or pounds to pounds. This Regulator can be used where space is limited, making it impossible to use the auxiliary bowl. In addition, Reynolds builds High Pressure Line Regulators with auxiliary bowl, when complete lockup is required. Let Reynolds adapt their new Versatile Regulator to your Gas Control System.

Reynolds GAS REGULATOR CO.

ANDERSON INDIANA U.S.A.

PRICELESS!...

200 Feet of 14½ Dia. BORED HOLE



Fast 5 Horsepower
MODEL 10-A
newest and largest
HYDRAUGER

Frequently a HYDRAUGER saves its entire cost on a single job; but what is still more important, most of the hundreds of HYDRAUGERS now in use have paid for themselves within a year on just ordinary day-to-day pipe installation jobs... there's *always something* for a HYDRAUGER to do—ORDER YOURS SOON!

Bores 2½". Reams to 4½", 6½", 8½", 10½", 12½", 14½".

OPERATES ON 90 LBS. AIR PRESSURE

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*Reg. U. S. Pat. Off.
EARTH BORING TOOL

HYDRAUGER CORPORATION, LTD.
116 New Montgomery St., San Francisco, Calif.

CONNELLY IRON SPONGE

For Real Gas-purifying Power

To get top efficiency in gas-purification at the lowest cost, use Connelly Iron Sponge. It's the finest purification material to be had.

Connelly Iron Sponge has a high degree of activity. It gives longer service before fouling. It revivifies more quickly. Leading gas companies have been using this "blue-ribbon" purification material for years — they know it can be relied upon to do the best job.

If you have a problem in gas-purification, take advantage of Connelly's 71 years of experience. Our engineers will be glad to help you . . . there is no obligation. Consult Connelly!

CONNELLY, INC.
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Immediate Delivery

METER CONNECTIONS

Straight Swivels and Nuts

Made of Screw-stock Steel, Electro-tinned

for use on 5-Lt. and 10-Lt. Meters

OTHER SIZES TO ORDER WRITE FOR PRICES

THE SCREWWERCS COMPANY
SYKESVILLE PENNSYLVANIA

Automatic Control of Radiant Panel Heating—Minneapolis-Honeywell Regulator Co., Minneapolis 8, Minn. The first part of this manual develops the theoretical basis of effective control for a panel heating installation in terms of the thermal properties which govern the design of the installation. The latter part includes a set of three design graphs introduced by an outline summary of the method of using the graphs for determining the required performance, and a series of control-system diagrams for various typical installations, accompanied by brief descriptive comments.

Research Publication, Illinois Institute of Technology—Vol. 4, No. 1, contains 12 illustrated articles on the subject of catalysis. A few of the topics covered are: Catalytic Dehydration and Dehydrogenation of Butyl and Amyl Alcohols, Catalytic Dehydrogenation and Condensation of Aliphatic Alcohols, Synthesis of Olefin Hydrocarbons by Catalytic Condensation and Dehydration of Aliphatic Aldehydes, and Production of Butadiene by Single-Stage Catalytic Dehydrogenation of Butane.

Xylene Technical Review — Oronite Chemical Co. This 32-page booklet is a compilation of the chemical and physical properties of the xylene isomers, together with an extensive bibliography. It should be of special interest to research workers in the organic chemical field. Individuals engaged in university or industrial research may obtain a free copy upon request from the Product Development Dept., Oronite Chemical Co., 200 Bush St., San Francisco 4, Calif.

Automatic Temperature Control Systems, Educational Bulletin No. 5—Issued by the Wheelco Instruments Co., 847 W. Harrison St., Chicago 7, Ill. Charts, tables and diagrams explain measurement and automatic control and the selection of proper control systems for process applications. "Thermocouples, Their Placement and Hints Governing Their Use" and "Selection of Thermocouple Protecting Tubes" are treated.

Heat Resistant Alloys—AGA Information Letter No. 11, by the Committee on Heat Treating and Finishing with Gas, Industrial and Commercial Gas Section. Under the chairmanship of Charles C. Eeles, the committee has compiled this report which presents to industrial gas engineers a brief but comprehensive and readily understandable discussion on heat resistant alloys.

Constitution and By-Laws of the American Gas Association — Available from AGA headquarters, 420 Lexington Ave., New York 17, N. Y. The new edition, including amendments which a large majority of the membership approved by mail ballot with the poll closing April 1, has been printed. Free upon request.

The Independent Petroleum Company —Senate Committee Hearings—Printed by the U. S. Government Printing Office for the use of a special Senate committee investigating petroleum resources, and distributed by The Independent Petroleum Association of America. The book contains 569 pages of testimony, charts and references.